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FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

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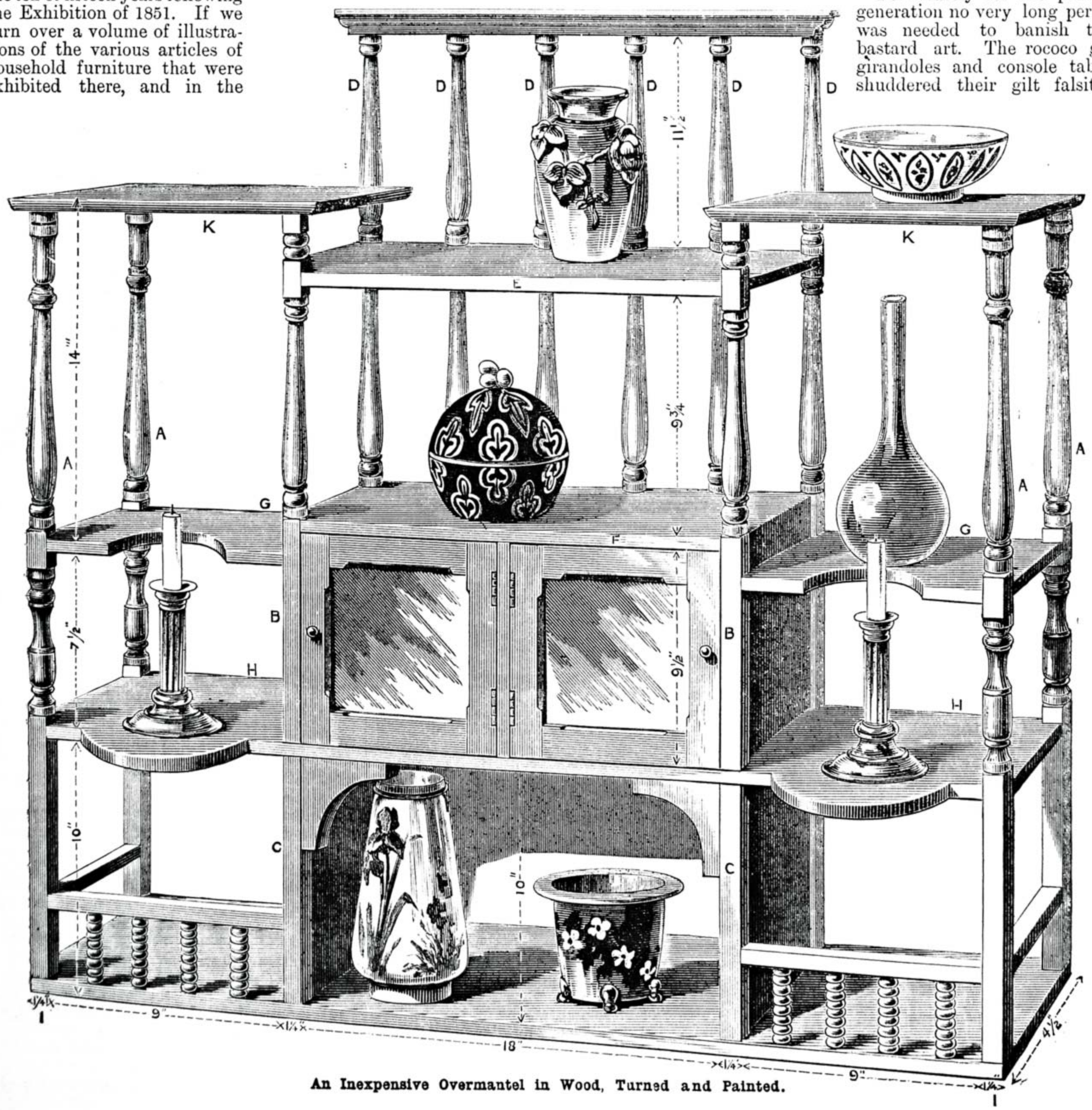
AN INEXPENSIVE OVERMANTEL.

DESIGNED FOR MORNING ROOM OR BEDROOM.

BY J. W. GLEESON-WHITE.

PROBABLY the national taste in domestic matters never touched a lower ebb than in the ten or fifteen years following the Exhibition of 1851. If we turn over a volume of illustrations of the various articles of household furniture that were exhibited there, and in the succeeding show of 1862, we are struck by the cheapness and vulgarity of the idea in their designs. A new attempt to beautify the surroundings of ordinary people was evidently beginning, but its first result appeared to be to oust all the merely solid and useful furniture of old form, ugly but fit, and to replace it by designs not one whit more beautiful, but overladen with tricky ornament. This practice of endeavouring to atone for commonplace and ungraceful shapes by applying lavish decoration, itself poor in quality, was even worse than what it aimed to improve upon.

Fortunately for the present generation no very long period was needed to banish this bastard art. The rococo gilt girandoles and console tables shuddered their gilt falsities



An Inexpensive Overmantel in Wood, Turned and Painted.

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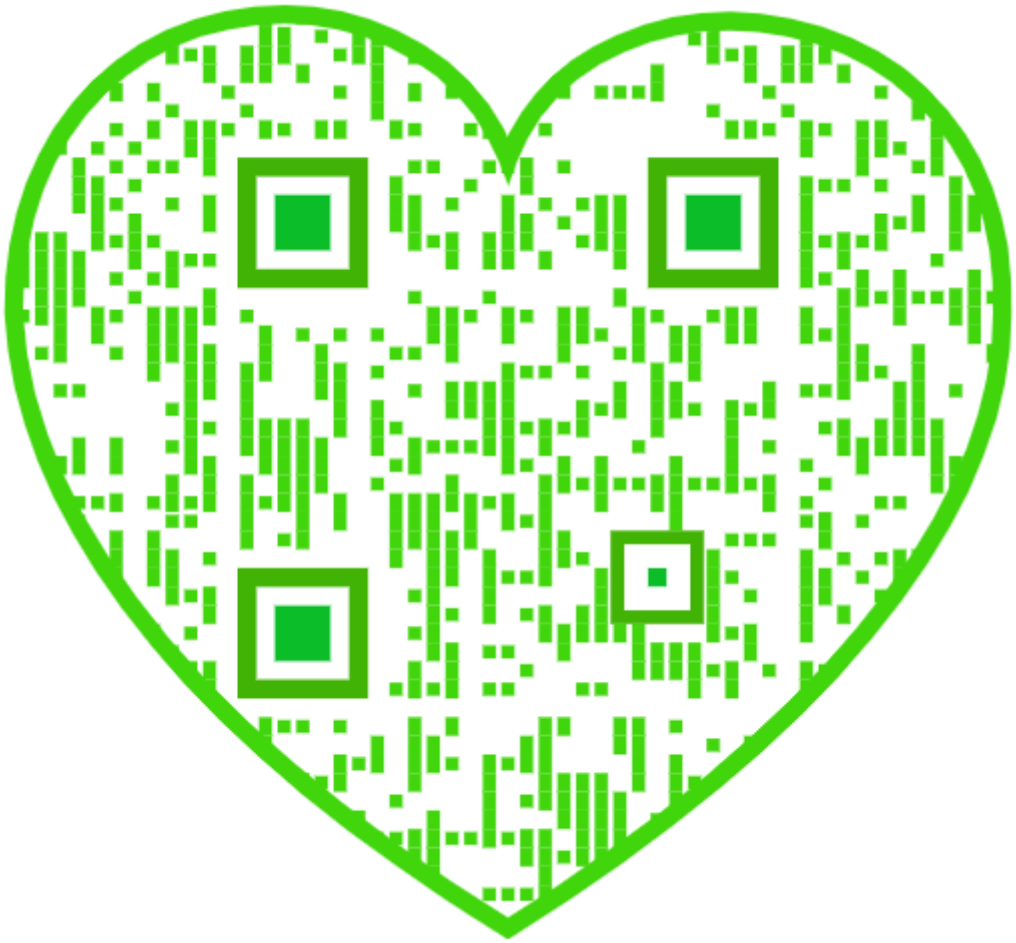

away quickly, but none too soon, and the bare meanness of their native composition became evident. The capital C's in violent agony stuck all over unmeaning curves of sideboard backs and sofas, shone in glittering varnish for awhile, and they too vanished into the great darkness. Into the night have gone one and all of these things; no longer gold and white wall papers chill us with their vapid flat surfaces; only third-rate apartments at the seaside, and such places, keep the frightful legend of their triumph; in every decent home they are gone, let us hope for ever.

But hardly had these things lost their popularity ere a new taste set in, growing suddenly into favour. Domestic Gothic, so-called, had almost overmastered us. A fierce faction fight between Gothic and all other styles seemed ending in favour of the former. Long considered the only suitable style for ecclesiastical use, it was rapidly invading our homes. From the modest and spiky Oxford frame, to the enormous monstrosities of the followers and imitators of Eastlake and Pugin, we were nearly in the bondage of Victorian Gothic. Our teachers, not content with proclaiming its infinite adaptability and inexhaustible resource, embodied in their creed a crusade against shams of all sorts. This movement in taste was preached with the fervour of a religion; an awful purity was insisted upon as necessary to artistic salvation. Nothing was to pretend to be other than it seemed to be. Nay, it was to exaggerate its honesty and be offensively obtrusive in setting forth that lately acquired virtue. Brick walls were to show their interior surfaces of bare brick; plaster was hardly less a deadly sin than stucco; plain paint (which surely is as honest as the plain wood) was scouted, with imprecations only less rigorous than those against the deadly artistic sin, the crowning of all wickedness—a grained imitation of oak. Rabid fanatics scarcely allowed varnish to preserve the surface and give a finish to the bare wood. In construction also, honesty was to be had at any price; joints were to be shown boldly; if any mortise was used, a protruding piece of wood, with a peg stuck through in full evidence, was to proclaim itself. Ceilings were forbidden to hide the rafters of the roof; padded chairs and sofas were to be replaced by hard wood seats with movable cushions. The motto was, "Perish comfort, appearance, everything, but simple honesty." This was excellent in theory, but in practice the result was as full of incongruities as the old mongrel style. It was out of place to imitate the vein of marble or the grain of wood by paint, or to line a plaster surface to suggest stonework; but to use a solid beam capable of carrying a roof for a small work-table, or to model a crusader's tomb in parian and adapt it as a match-box, were permitted things. It was held a pretty conceit to decorate tea-cups with raised sprays of the tea flower, to embellish marmalade jars with oranges, to decorate a night lamp with the deadly nightshade. To make a sideboard simulate a high altar, or a piano reproduce a reredos, was a noble aim; but to employ classic detail, however fitly, or use turned wood in place of a chamfered bar of rectangular form, put the artist outside the pale of sympathy.

No doubt such failures to embody workable every-day principles are natural incidents in a new search after beauty. The taste so long dormant had lost its fundamental rules, and the caprice which led its knight-errants upon such strange quests, was nevertheless an instinct groping in the dark after the right way, and vaguely and tenaciously trying almost any path save those lately trodden, which might bring it to the goal of beauty.

But it would be wearisome to multiply instances of the vagaries of the new Gothic and Vandal. When his havocs are fully known, it may be the period that saw the restoration of our old cathedrals and a revival at last of real domestic art, will be found in its course to have done damage irreparable, and beyond the worse neglect of the Georgian indifference. But just as Gothicism was triumphant, a small body of young men experimented in a free classic style, chiefly Dutch, that for some mystic reason they called Queen Anne; and straightway the elaborately built-up system of the new Gothic went to pieces. This fresh movement, by its adaptability and extreme catholicity, certainly did a few very wild things, but side by side with the so-called æsthetic movement, and the real art produced by men of the stamp of William Morris, and others, a new style arose. Some decorative artists to-day have done work worthy of placing beside that of any epoch, and if, as we hope, beauty is now to be found waiting for any who will welcome it to their houses, to all such in their different ways the good influence may be traced.

The Queen Anne school revived the banished art of the lathe, and in its desire to reassert that honest and entirely legitimate use of wood has, in the hands of its imitators, somewhat ridden it to death, chiefly, it would seem, by using an infinity of small balustrades and spindles; for even yet the influence of the Gothic craze rather shirks the employment of massive turned work, such as held sway in the Jacobean period. Yet, at its very worst, this fashion is not quite so absurd as the shapelessness of the unmeaning walnut and green rep period, or the huge timbers of the style known in America as Eastlake, and with us church milliner's Gothic.

Turnery is an ancient art, and well deserves all praise, for it is excellently proper in its treatment of wood, reducing for purposes of ornament the superfluous material, with very small loss of strength; and in its subtle shadows giving more pleasure than the angular framework of the Gothic period when used without the lavish carving which is a needful part of that style.

In saying so much in praise of turned work, and then recommending the purchase of machine-turned wood, I feel I am likely to gain opposition.

The amateur of feeble attainments is looked down upon by masters of the craft. They actually prefer the best solid carving to inferior ill-designed fretwork, and really choose inlaid marble pavements, rich with mosaic work, in place of cheap oilcloth. Excellent people! to have such splendid virtue, and such well-filled pockets! But the amateur workman may neglect such wise counsel, and do his best with what tools and skill he possesses to please himself. The want of a good lathe powerful enough to turn large work is often felt, for cost and skill are not the only items that prevent it. Time and space are equally exacting, and defeat too often his desired end.

A year or two since, at one of the exhibitions, the steam turnery on view was a fascinating exhibit; and looking at the display of specimen balusters and newels, at a price less than the raw material itself would cost a private buyer, it seemed a good idea to endeavour to utilise them in home-made furniture.

Painted chairs and tables in bright decided colours were then uncommon, but while this long-delayed notion has been waiting for time to set it forth, painted furniture has taken great hold of the public, and the apology then necessary is now needless, since every upholsterer's window has its strawberry-ice colour milk stools, its sealing-wax red five-o'clock tea tables, and its art-colour brackets. Art colour—that terrible compound work is enough to condemn anything. Is not any colour an art colour if you have the art to use it rightly? And cannot magenta itself, the most difficult of all, be used by a master wisely and well? But as some colours naturally come well together with less care in grouping, and the secondary and tertiary subdued peacock blues, citrines, and dull yellows, may be thrown together almost hap-hazard and yet be harmonious, these and similar are dubbed art colours. Yet ignorant nature uses the crudest to be found, but uses them so deftly that her un-art colours beat your best attempts hollow. If you are uneducated in colour, how can you be expected to compose a colour scheme, any more than write a symphony with no knowledge of music, or solve an astronomical calculation ignorant of the simplest rules of arithmetic?

But the painting is the last item of the work, and will be returned to later on. The article under notice to-day is the first experiment in the use of these cheap turned balusters mentioned above. Messrs. M. C. Duffy and Co., 66, Storks Road, London, S.E., at the International Exhibition, 1885, had a splendid exhibit of machinery and work turned out by them. On a price list they issue, a hundred designs of these wonderfully cheap balusters will be found illustrated. When the cost ranges from 1s. 6d. a dozen, cheapness promised by the title of this paper, may be claimed to be secured. The same patterns in pitch pine cost almost double the price. For some of the larger scale designs the cost is a trifle more, so, too, the more elaborate spirals and intricate designs are naturally somewhat dearer; but even the most expensive are absurdly cheap set against the time, skill, and plant required to produce their equals at home. For our purpose, in this first chapter, but two designs in 1¼-in. deal will be required; these, at the minimum price of three halfpence each, will suffice for constructing a really useful, and in its way artistic, piece of furniture.

Before proceeding to explain the construction, it is as well to note the novel points in this design. It is the result of an attempt to make, first of all, a more really useful adjunct to the toilet, and a desirable addition to the ordinary fittings of a bedchamber.

The cupboard, itself useful for keeping odds and ends out of sight, serves the purpose of a toilet glass more thoroughly than usual, since its doors opening at any angle give a reflection of each side of the face. For shaving purposes, or the magic art of putting on a bonnet, this is no mean gain. But as daylight is not always available, special efforts to gain the utmost light from a couple of candles are also within the purpose of the design. It is claimed that, by the arrangement of shelves here shown, a strong light is cast upon the face (as I can speak from actual use), and thereby assists the delicate operation of the amateur barber, or the manipulating legerdemain of

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the culminating touch on the coronation of a new bonnet, with no small gain of ease and comfort.

The glass doors are set at a height likely to be useful to most people; but as mantelpieces vary a little, and personal stature even more, may be the maker will find other level the most pleasant. This must be found individually; at present it suffices to say that the size given answers its purpose thoroughly. To harmonise with its surroundings it is finished in pure white enamel, has on its shelves old blue and white china and brass candlesticks, and in its place would never suggest its humble and economic growth, but appears like a fairly expensive construction that would cost a few pounds to acquire.

The overmantel here set forth and described, was primarily intended for a bedroom, and has particular features designed specially to be useful for purposes of the toilet. But after the work was finished, these said features presented no outward sign of their purpose, and it was debated whether it should occupy the position intended, or be placed in a study. Before pointing out the object in view, it might be as well to remind the reader that, in spite of nearly a hundred patterns in these cheap balusters available from designs kept in stock, yet only comparatively few are so planned to be useful for furniture, as those patterns which have no square stops, where the features of the turning give way to the plain wood, are not so suitable for the purpose, nor capable of being explained away in the design. Therefore, if the design here given is not carried out literally to the directions, the trouble of modification will be greater than it appears. This, of course, presumes that the amateur has not the power of turning his own spindles to order, but relies solely on Messrs. M. C. Duffy's stock, or the marketable produce of some kindred firm to provide the turnery of his work.

The chief hindrance in planing this piece of furniture was to group the uprights that the shelves would not be carried across the whole façade at the same level. For in that case the effect would be merely that of a piece of ordinary shop-fitting. To avoid this disfigurement was much less easy than it seems, and only secured by arranging the actual balusters themselves, a quantity of which the makers kindly placed at my disposal for practical experiments. As the balusters have each their own number in the price list, it will suffice to indicate them so, as in each case I shall give a duplicate sketch of the piece itself as it stands upon the makers' pattern sheet.

This overmantel will require eight of No. 1 (1¼ in.) and four of No. 50, also 1¼ in. section. The few spindles used for the bottom rails were turned specially for me by the makers, costing, if I recollect rightly, a fraction under one penny each, by the gross. They are most useful; a gross and a half disappeared in a very short time; but when I look at the many attractive pieces of painted furniture of which they are the sole decoration, I feel that a more useful and inexpensive ally has hardly ever been brought within reach of the non-lathe-possessing amateur before. The only materials required beyond these balusters are a few pieces of ordinary wood, deal, pitch pine—any, or every sort it matters not, since all will be covered with enamel—and the two looking-glass panels of the doors. If the mirrors are of ordinary silvered glass, the expense is but a trifle; it would greatly improve the whole to use thick bevelled squares; the cost of these, for the size given, was, if I remember rightly, 5s. 6d. or 6s. the pair. As, however, it was rather a trouble to get them sent to me, I used ordinary glass, but feel that the improvement gained by the bevelled plates would well repay the difference in the price.

The four No. 50 uprights, A, at the outer angles of the erection, are used with the waste wood at their base exactly as they came from the makers; planed and sandpapered of course, and otherwise made ready for painting. But the two No. 1 that are in the central portion of the front, B, start from the shelf, H, which runs right across the mantel and forms the floor of the cupboard. To keep the line of the upright, pieces of wood, C, cut off, the other balusters used against the wall were fitted below the shelf running down to the base-piece. In the design this explains itself easily. At the back of the whole, six of No. 1 are planned to carry the shelf, E, and form, as it were, the motive and central idea of the whole design. These might be limited to two, but from experience I strongly advise the use of the number shown; it is just this comparatively lavish use of the balusters that gives a certain character to these designs, and in the finished work takes away a poverty-stricken effect they would otherwise be likely to offer. As this thickly-set railing is intended to be the feature of all the designs in this series, it is needful to emphasise its importance. The whole design may fail to please many; in that case I would say discard it entirely; but if you work it, at least try, by a preparatory rough fitting together of the several parts, the effect of the work as illustrated in the sketches, before attempting to be economical in the use of the turned rails, which are the characteristic element of this group.

It will be seen that the two uprights, B, are cut off at a height corresponding with that of the outer pillars, A. As what was cut off at A is waste wood, it explains itself, but at B a part of the baluster itself is sacrificed. The way I managed it was to cut from the upper feature of No. 1 all the pear-shaped portion, and use, as it were, the base of the upper half and its capital, without the pillar itself. Consequently the upper part of B is in two pieces, but for so short a support, carrying no particular weight, this matters not, the gain to the eye in making the level line of the top shelf being more than enough to reward the maker for the slightly increased trouble. The six rails, D, carrying a top moulding, are so clearly explained in the diagram, that more need not be said.

Now concerning the shelves, it will be enough to note that the shelf I at the base runs across the whole width, so too does the shelf H, but at its either end it has half circles of the same thickness added, for reasons explained elsewhere. In the short shelves, G, at the sides, a corresponding piece is cut out, not necessarily corresponding in size, but both the added curve and the cut out are exactly over each other, to allow a candlestick placed on H to keep clear of the shelf, G, and avoid setting fire to the upper shelf; the shelves, K, at the top of the sides are too far off to be dangerous in this respect.

The shelf, F, above the cupboard, is placed almost close to where the square wood of the upright yields to its turned portion, the space thus offered being closed by two doors, *hinged upon a central upright*, between shelves H and F. These doors are mortised frames of ordinary design, chamfered but not otherwise decorated; the panels of looking-glass are let into a rabbet like an ordinary picture frame, and backed with plain thin wood. Of the small bracket-pieces below the cupboard, and the low railing at the foot of each side compartment, it will be needless to speak.

The balusters themselves decide the right position of all the other pieces, and the measured diagram shows clearly when they fit with regard to the adjacent parts. Looking at the finished structure, I feel that a photograph of it, were it possible, would show a much more tempting article than my sketches suggest.

If used for some apartments, ebonising might replace enamel. Personally, I think the scale too heavy for black finish, and would rather use a peacock blue or scarlet enamel, but that is after all a mere fancy of the owner. Varnished pitch pine would look clean and wholesome, and match the popular bedroom suites in that material. But to each person who is interested in it, a different finish will probably suggest itself, so that to-day we may leave it, and in our next try other pieces of furniture made from the same materials, or with the addition of others equally inexpensive.

THE MICROSCOPE: HOW TO MAKE IT.

BY O. B.

INTRODUCTION—GENERAL METHOD OF FOCUSSING—MODE ADOPTED BY WRITER—FOCUSSING ARRANGEMENT—FOCUSSING SCREW—STAGE—ARM—STAND—POWER TUBE—OBJECT GLASSES—EYE PIECE—MIRROR—FINISHING INSTRUMENT.

OF all instruments employed in physical research, there is hardly one of such universal interest as the microscope. To all thoughtful, cultured men, a telescope is of great interest; but even cultured men cannot command "the clouds and the rain," and the number of nights available for astronomical work in a year is fewer perhaps than most people would imagine, or, at least, in our country, so remarkable for its fogs and rain.

Electrical apparatus are also of great interest when used with a certain amount of previous knowledge, but little else than amusing to the uninitiated, or, at most, wonderful. But the microscope is equally interesting and instructive, even to a child, and objects are everywhere abundant. To be able to bring invisible forms of life into view; to reveal the marvellous decorations which are so wonderfully lavished on multitudes of minute organic forms, is at once an education and an enjoyment. But a good microscope is an expensive instrument. No doubt a great deal is paid for appearance and finish, yet it must be understood that to a great extent the value of the instrument is in proportion to the amount of labour expended on it. Apart from the optical part, its value depends on its steadiness and smoothness in use. Its moving parts must be accurate in their adjustment. Every tremor or shake becomes magnified, and unless the stand and adjustable parts are rigid, but little satisfaction can be derived from its use.

Most people have seen street vendors with little globes of glass filled with water sold for the universal penny. The writer remembers, when a boy, seeing with wonder, by the aid of such a magnifier, such creatures as eels in paste and vinegar.

Years after he tried his mechanical skill in making a microscope by the aid of

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tinplate and pasteboard. It was a rough affair, but by its means he was able to trace the circulation of blood in the tail of a tadpole, and which sight was esteemed as a fair equivalent for the labour bestowed. Since then he has tried his hand on many an optical instrument, but perhaps the pleasure derived by using his microscope with a tin tube and pasteboard stand was as genuine as any derived at a subsequent date by the use of more finished instruments.

The instrument which I have designed, and which I propose describing for the readers of WORK, is, as far as I know, original in its construction, and will be found not only as easy to make, but in some respects more efficient than some of the ordinary types as far as its focussing arrangements are concerned.

The general method employed to focus is that of the rack and pinion, either acting directly on the power tube or through a bar in the stand, the latter method being employed in the more expensive instruments. Another plan is that of a chain instead of a rack, but I have not seen many of this type. But these methods are simply for coarse adjustment; for high power something far more delicate is required. This finer adjustment is obtained generally by a screw operating on a lever.

In the arrangement I have designed I have done away with the rack and pinion, which, unless well made, is a constant source of trouble; and also with the lever. A fine cut screw acts directly on the focussing bar, so that an object may be focussed to any degree of fineness, depending on the number of threads to the inch on the focussing screw. It can thus be used for measuring thin films up to, say, from a 2,000th to 4,000th part of an inch thick. If due care is observed in working out the details, a good and substantial instrument will be the result. I assume that my reader can use a few tools, and has in possession a lathe, and can cut a screw. If he cannot do the latter, then in most towns there are brass finishers, who, for a small consideration, would do all the screw cutting required. Besides this, there is nothing that an ingenious worker cannot do except the few castings in brass.

The principal parts of our instrument are, first, the focussing arrangement; second the stand; and third the optical tube. As the first part mentioned is somewhat more complicated than the others, we will commence with it. Procure three lengths of brass tubing, one piece $5\frac{1}{2}$ in. long by 1 in. diameter, one piece 5 in. long by $\frac{5}{8}$ in. diameter, one piece $3\frac{1}{4}$ in. long and large enough to slip over the smaller of the two tubes; whilst it will admit the tube there must be no shakiness. In Fig. 1 the tubes are lettered *b*, *c*, *d*. Tube *d* must have a ring of brass $\frac{1}{2}$ in. wide, soldered at one end as shown in Fig. 7. Before driving on the ring, file the inside bright, also the outside of the tube. If too tight put a fine saw cut in the ring, and spring it on. Moisten the parts well with the soldering fluid, and then with a hot bit cause solder to flow in the joint. By making the brass hot, the solder will run through the joint and the work will be solid. If a gap is left where the ring was cut, a thin slip of brass must be soldered in it.

Now take $\frac{1}{2}$ in. of tube, *c*, and having cleaned it on the outside insert it in the same end, and solder it; cut out roughly a disc of brass $1\frac{1}{4}$ in. diameter, and solder it to the end. Put the tube in a chuck and turn down the collar, chasing a thread on it, and turn down the end with a central hole $\frac{1}{4}$ in. diameter. When this is done, draw a line down the tube with a sharp point; be careful that it is parallel with the axis of the tube, as if it is not our whole action will be imperfect; the reason of this will be seen as we proceed. With a saw or file slot down the tube to the collar. If a circular saw for brass is attached to the lathe, there will be no difficulty in cutting the slot correctly, which must be, say, $\frac{1}{8}$ in. wide.

We must now proceed with tube *c*. Each end of this must be plugged with a short length of tubing. We will suppose it rather too large to work smoothly in *d*; we will therefore put it in the lathe and true it up, and bring it to such a size that it will work without a shake. Cut a strip of brass 3 in. long, and, say, $\frac{1}{4}$ in. wide and $\frac{1}{8}$ in. thick;

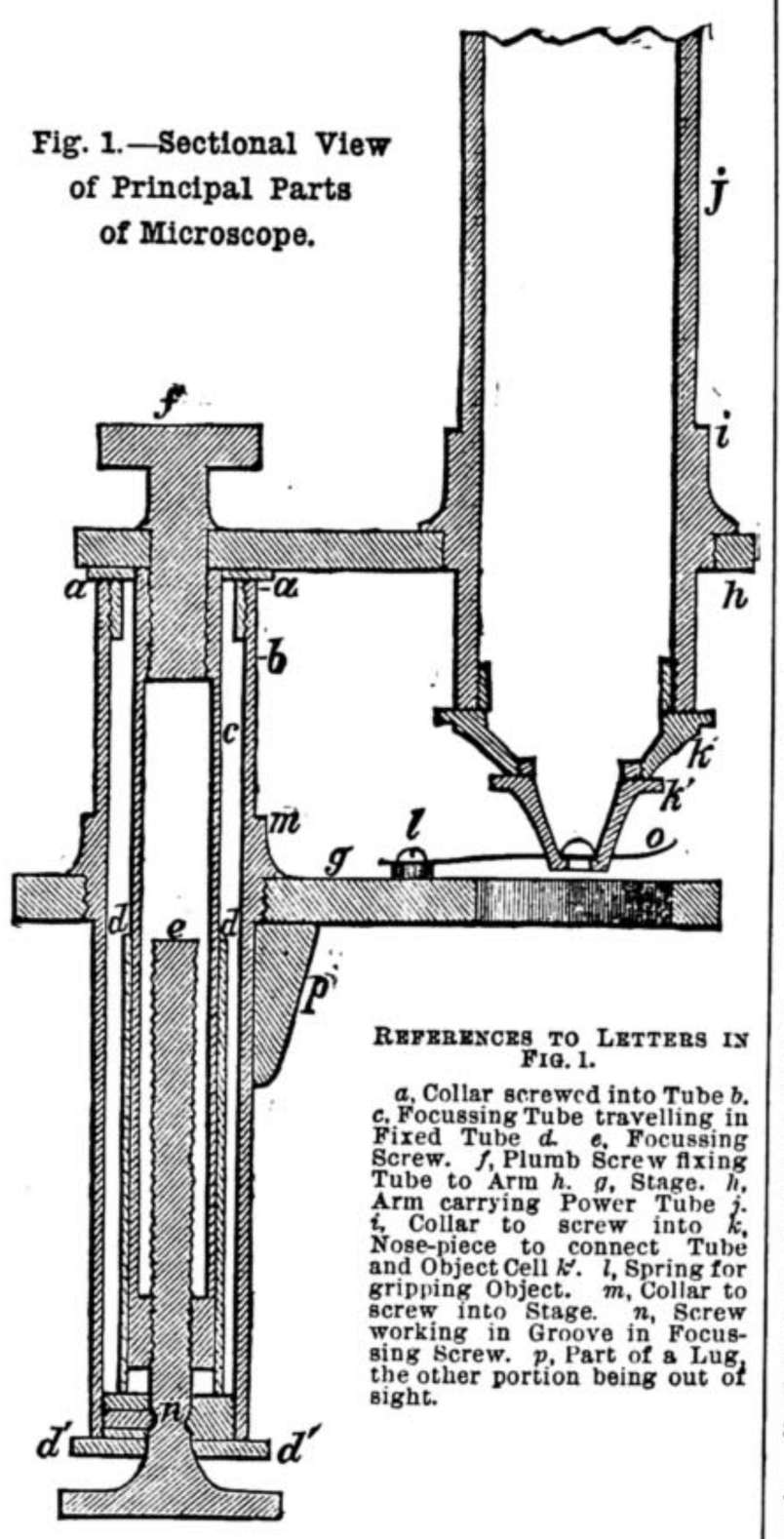

Fig. 1.—Sectional View of Principal Parts of Microscope.

REFERENCES TO LETTERS IN FIG. 1.

a, Collar screwed into Tube *b*. *c*, Focussing Tube travelling in Fixed Tube *d*. *e*, Focussing Screw. *f*, Plumb Screw fixing Tube to Arm *h*. *g*, Stage. *h*, Arm carrying Power Tube *j*. *i*, Collar to screw into *k*, Nose-piece to connect Tube and Object Cell *k'*. *l*, Spring for gripping Object. *m*, Collar to screw into Stage. *n*, Screw working in Groove in Focussing Screw. *p*, Part of a Lug, the other portion being out of sight.

draw a line down the centre and file down to it, leaving three pins as represented.

On the lower half of tube *c* draw a line parallel with its axis; bring the strip just made to the bottom, and mark where the pins come, and drill holes to receive them; this must be soldered to the tube. When filed up, it must just fit the slot in tube *d*. A thread must be chased in each end as shown. We will now take tube *b* in hand. One inch and a half from the top a ring $\frac{1}{2}$ in. wide must be soldered, and over this another $\frac{1}{4}$ in. wide. The tube must now be chucked in a lathe, and the rings must be turned down as in Fig. 1, with a thread chased on it. A thread must also be cut in each end—the lower end to take the collar of tube *d*.

To a ring $\frac{1}{2}$ in. deep, and too large to enter the tube *b*, a disc must be soldered; this must be turned down, and a thread chased on it to fit *b*. In the centre of the disc a hole must be turned large enough to admit tube *c* without shake.

We now must make our focussing screw *e*, Fig. 1. This may be made either of steel rod, with a brass head cast on it, or entirely of brass; if the latter, we can either have it cast, or we can make it of $\frac{3}{8}$ in. brass rod, and screw and solder a disc $1\frac{1}{4}$ in. to it. This, of course, will be a little less expensive, but will not look quite so well. It must be turned up true, and a thread cut on it to within $1\frac{1}{4}$ in. of the head.

The number of threads per inch on this screw is a matter of consideration; 25 will be a desirable number, for reasons to be dealt with afterwards. Place the tubes one in the other as shown, and insert the screw, screwing it as far as it will go. In the collar of *c* drill a hole and tap it, and make a screw to fit, with its end rounded off; insert a scribing point in the hole and mark the focussing screw, and either with a rat-tail file or in the lathe, cut a hollow, as shown, to receive the end of the screw in the collar. It will now be seen that when the focussing screw is engaged with this little bolt and turned around, the tube *c* will be forced out of the larger tube. The bar in *c* travelling in the slot of *d* will prevent the tube turning around, and in proportion as our work is good, so will be the smoothness of the motion. By turning the head once round, the tube will travel $\frac{1}{25}$th of an inch; by turning $\frac{1}{4}$ around we shall regulate it to $\frac{1}{100}$. But any definite degree of motion can be obtained by the screw—thus: when the screw is in the lathe, mill the edge of the head, then turn the edge of the head off square, so as to show the milling like the cogs of a wheel. With a magnifying glass count off, say, twenty teeth, and with a fine-pointed graver cut a line from the edge to the centre. When they are all marked off they can be again divided into tens. With small steel punches the lines may be numbered, say, by twenties. We will suppose there will be 200 serrations on the milled head. If we turn the screw from 0 to 10, the tube will be moved through a space equal to the 500th part of an inch; or if we move it to the extent of one degree the movement will be the 5,000th part of an inch. I admit that great accuracy in working must be observed to arrive at such results, but with care and skill it can be done. If this idea is carried out, an indicator with a needle point should project from the lower part of the tube, to come almost in contact with the head.

Our next business will be the stage. For this purpose we shall require a piece of brass $4\frac{1}{2} \times 3\frac{1}{4} \times \frac{1}{4}$ in.; it may be either cast or worked out of sheet—the latter will, perhaps, be the easier plan. Fig. 2 shows both the under and upper sides. In A is shown the position of the lugs; these must be $2\frac{1}{4}$ in. apart. First of all, finish the stage as far as its outline, seeing it square and true. Fix upon the centres for the holes, these centres being exactly $2\frac{1}{2}$ in. apart. Mark with a compass the curved outlines, and file down to the line. The top side of the plate must now be filed dead level. In the absence of a better tool, a piece of plate glass will be a good substitute to test its surface. Rub a little grease on the glass, then press the stage on it, when its inequalities will be made manifest. These must be scraped or filed down till the stage shall touch the glass on its whole surface. The holes should be cut in the lathe; fix them in the face plate, and push the head centre forward until the point touches the stage. Move the stage until the punch marks are opposite the centre, and clamp the stage in position. Be sure by measurement of the size of the

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rear hole, as it must fit, when chased, the collar in Fig. 1. On the under side mark off two lines equidistant from the centre, and with a square determine the position of the lugs. These must be made of sheet brass of the form showed at Fig. 10; two pins must be left on the top edge, as shown by dotted lines. They should be filed up together so as to be exactly alike; it would not be amiss to fasten them together by a touch of solder. Whilst joined, drill the bolt hole. It is of the utmost importance that these should be coincident when they are filed up to proper form; the sides must be made perfectly true by the same means as have been employed for the stage. Place a lug on the stage by the lines marked, and see where the holes for the pins have to be drilled. Let these be $\frac{3}{16}$ in. deep. Now file the pins so that the lug will bed dead on the plate. With a square test it so that it shall stand perfectly square and true. Run soldering fluid around the joint, and with a hot soldering bit run solder well into the joint. See that there is plenty of solder, and that the tool is hot. Now treat the other lug in the same way, being careful that they are perfectly square and true with each other. If the pins are a good fit, and the soldering is good, the lugs will be just as strong as if they were cast. B shows the top of the front part of the stage; three holes must be drilled at *e*, *f*, *f'*, and carefully tapped.

Two pieces of thin steel must be bent, as shown in Figs. 1 and 2. Any watchmaker will supply a broken watch spring for the purpose. Take out the temper, drill two holes, and bend to shape as shown; harden, polish, and then temper again. These will be screwed in position as shown, with brass washers under them. Cut a circle of $\frac{1}{16}$ in. brass $2\frac{1}{2}$ in. diameter. Make faces true—it will be better if the edge is milled; it must have a centre hole to take a small bolt, by which it is to be screwed to the under part of the stage as shown, with a washer between. Four holes must be drilled: *a* must be the same diameter as the opening in the stage; *b*, *c*, and *d* must graduate smaller, as shown by dotted lines. Care must be taken that the centre of each hole is coincident with the centre of the opening in the stage. This can be secured by measuring the distance between the centres of the hole in the stage *e* and *a*, and then drawing a circle on the revolving diaphragm. This circle will then indicate the position of the centre of each opening. A short tube must be soldered to the under side of the plate, around or in the largest opening, as shown in Fig. 11; the use of this will appear further on. The stage can now be screwed to the tube collar, Fig. 1.

The arm, Fig. 3, now claims our attention. This may be cast or worked out of $\frac{1}{4}$-in. sheet. The centres of the holes must be $2\frac{1}{2}$ in. apart. The form should be marked out with the compasses, carefully marking with a centre punch the position of the holes. The arm must be finished off with care, and be dead true. The holes should be turned in a lathe. It must be bolted to the face plate, and its position found by the aid of the dead centre. The large hole must have a thread chased in it; the small hole must be large enough to admit a headed bolt *f*, Fig. 1, which screws into the live focussing tube *c*. The head of the bolt must be milled.

Our next work will be the stand. Now, an essential quality of a stand is that it

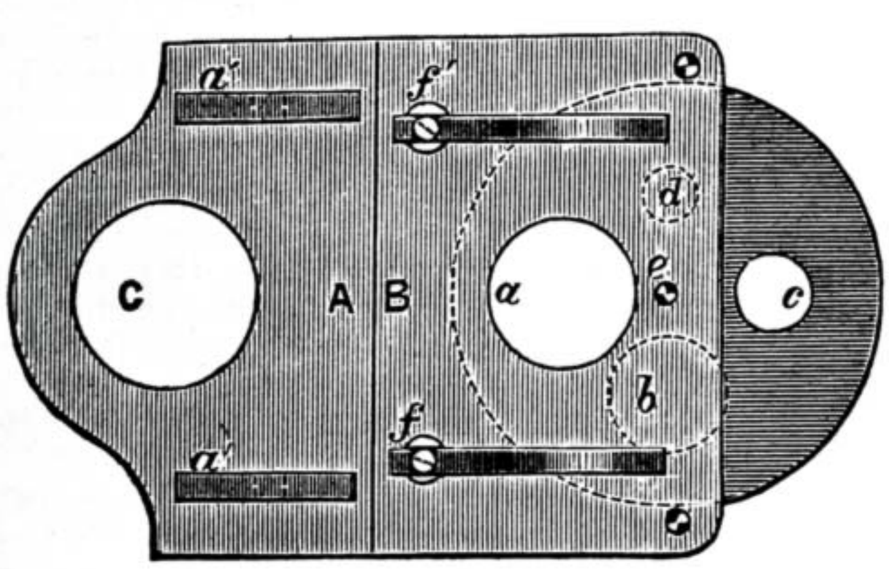

Fig. 2.

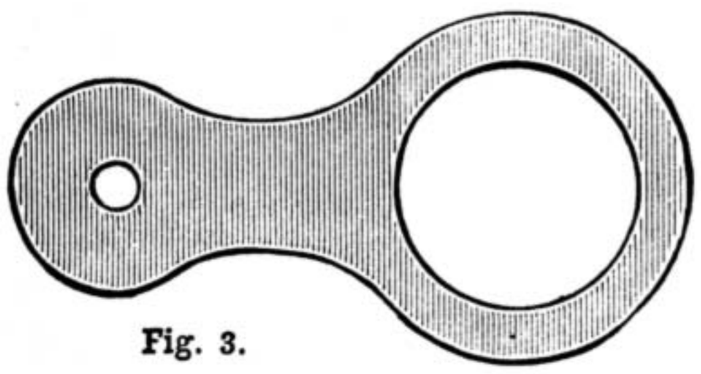

Fig. 3.

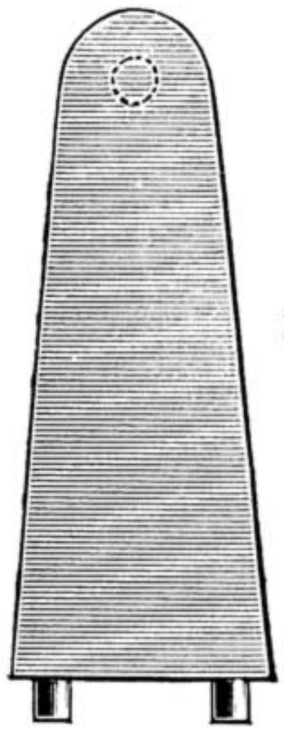

Fig. 4.

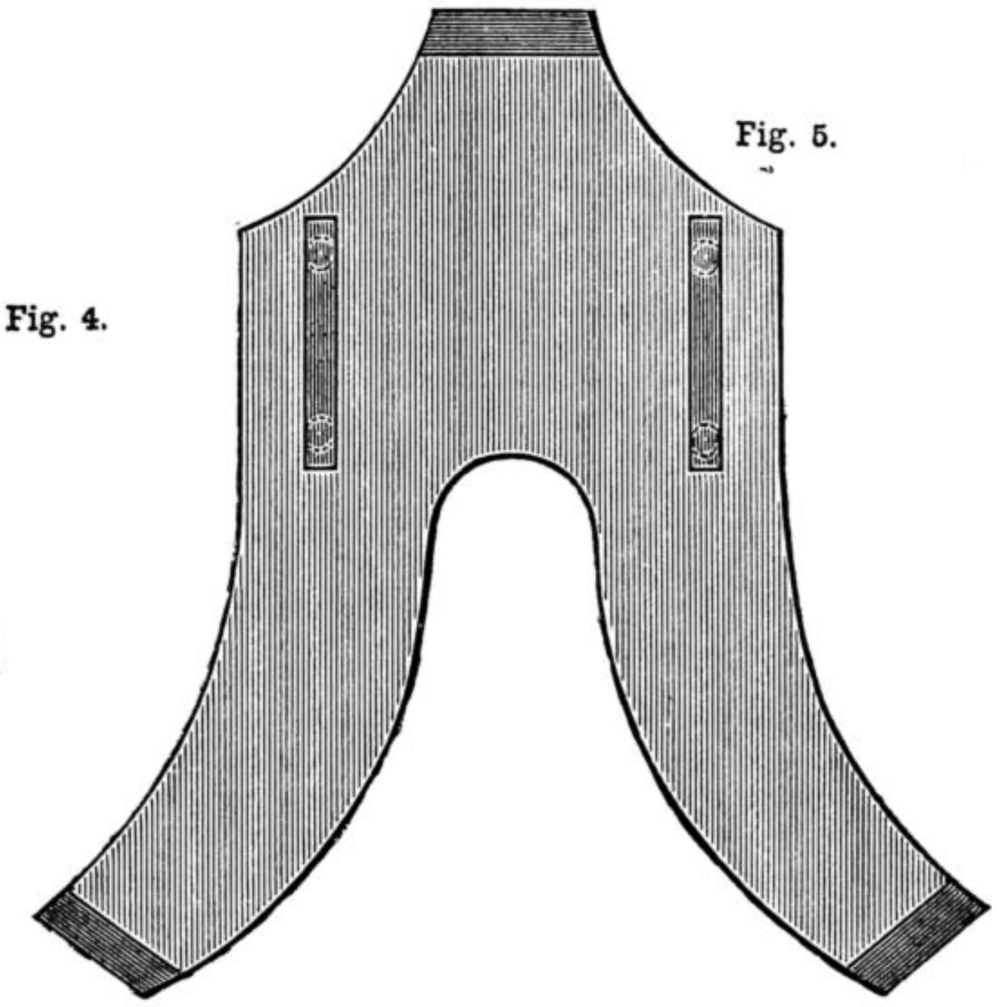

Fig. 5.

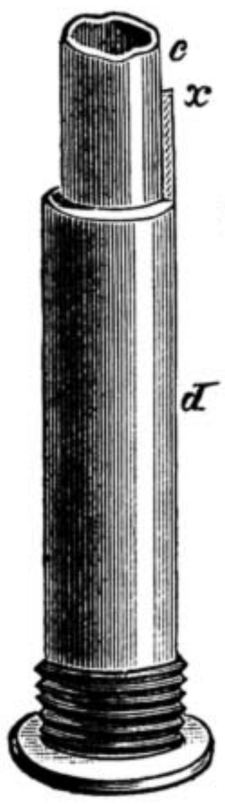

Fig. 7.

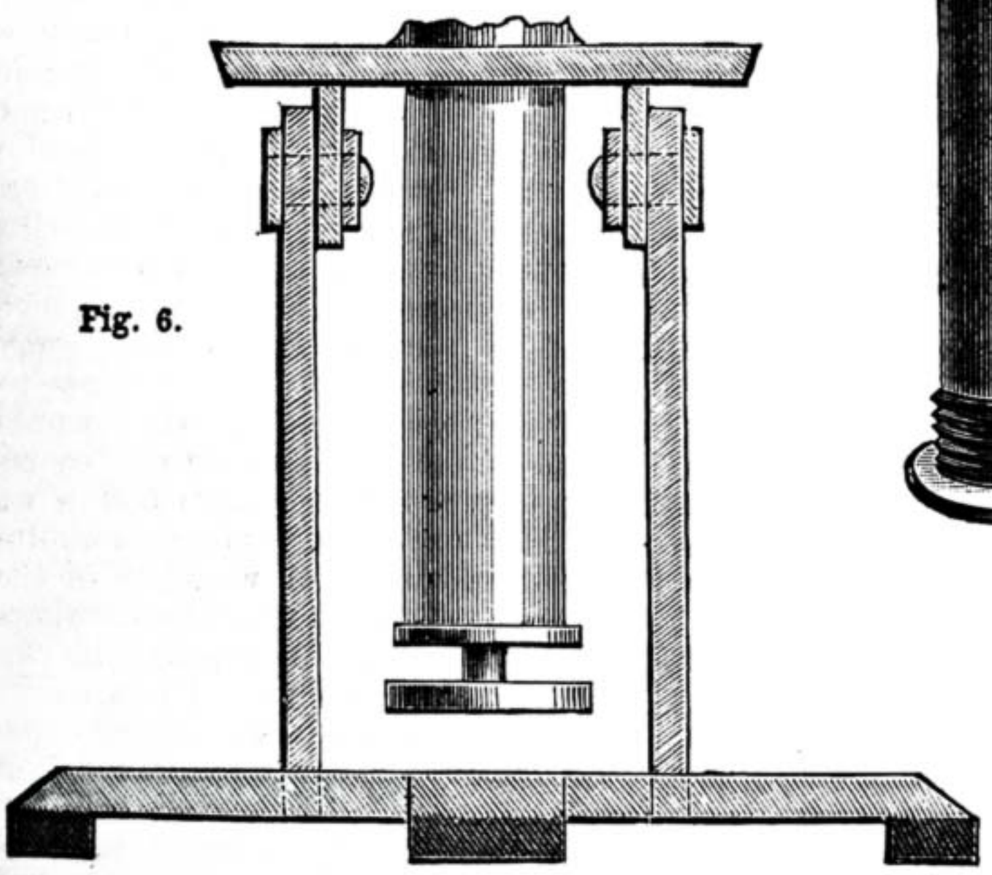

Fig. 6.

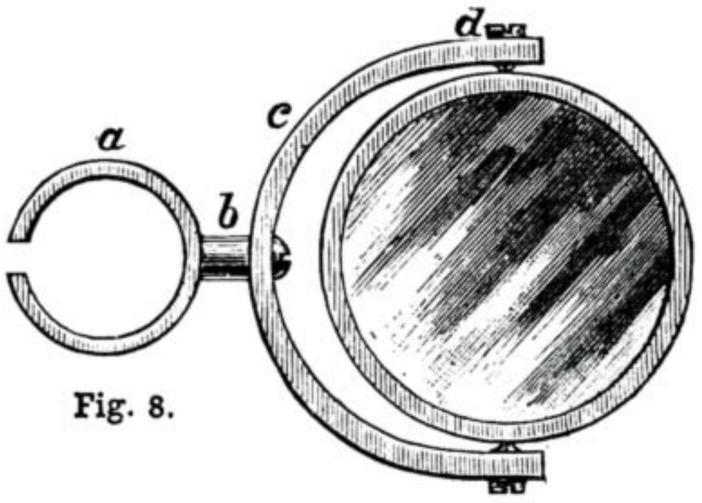

Fig. 8.

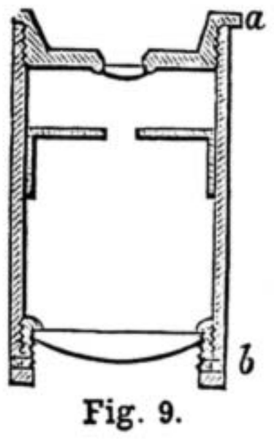

Fig. 9.

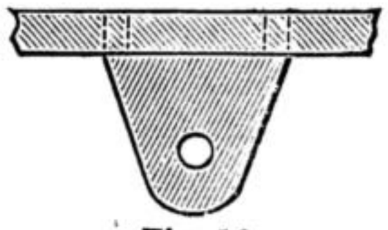

Fig. 10.

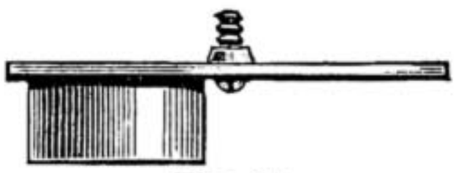

Fig. 11.

Fig. 12.

Fig. 2.—Stage Plate, showing Half Under Side (A) and Half Upper Side (B)—*a'*, Position of Lugs; *a*, Opening for Objects; *b*, *c*, *d*, Position of Holes in Diaphragm; *e*, Hole for Pin of Diaphragm; *f*, *f'*, Springs. Fig. 3.—Arm for Carrying Tube. Fig. 4.—Standards. Fig. 5.—Top View of Stand. Fig. 6.—End View of Instrument, showing Nuts and Bolts securing Stage to Stand. Fig. 7.—Focussing Arrangement—*c*, The Live Tube moving in *d*; *x*, The Guide Bar moving in Slot in *d*. Fig. 8.—Mirror. Fig. 9.—Section of Eye-Piece. Fig. 10.—Lug to Stage Plate. Fig. 11.—Diaphragm Fixed to Under Side of Stage Plate. Fig. 12.—Section of Casting of Cell to carry Field Lens.

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shall be heavy and steady on its feet, as the least unsteadiness is fatal to microscopic work. We shall now, I am afraid, be compelled to seek the aid of the brass-founder, so we must prepare our pattern. Out of ⅛-in. well-seasoned wood, say mahogany, cut a pattern as Fig. 5, but ⅛ in. less all round. From heel to toes 6 in., across the toes 6 in., across the sole 3¼ in. Cut strips of pine ¼ in. and ⅛ in., boil them, and whilst hot, spring them to edges of the pattern; it will be advisable to cut them a little wider than ¼ in. so as to allow for dressing off. The wood can be easily bent to all the curves except in the circular part between the toes. Perhaps the easiest plan will be to turn a piece out solid, as a disc ¼ in. thick to fit the curve, cut across the diameter and fix by glue, and then with chisel and round file work it out.

The toes and heel must be finished off ½ in. deep, as shown in Fig. 6; when finished off perfectly true, black-lead it and take it to the brass-founder. The casting must be accurately filed up and trued as before described. The edge at toes and heel should be filed off as shown by the shadings. Two standards must be cut out as Fig. 4, 4 in. high, and 1⅝ in. wide at the base. Two pins must be left as shown. These, like the lugs, must be worked up together and the bolt holes coincident. Measure the exact width outside the lugs on the stage; this must be the measure of the distance between the standards. Find their position on the stand by the method described for the lugs, and drill holes for the pins, which, in this case, may go through the plate; be sure the standards are true with the foot and with each other, as accuracy here is everything. In this case more care must be observed in soldering than with the lugs, as now we are working on the top of the plate. The plate should be soldered first where the standards are to come as well as the bottom of the standards and pins, and then sweated together. If, when put in position, a hot bit is brought close to the joint, the solder will melt and allow the two pieces to come together. It will be done best as a three-handed job, as care must be taken that they are perfectly square with each other.

Two bolts and nuts must be made as shown in Fig. 6, by which the stage and the stand may be fastened together. Observe—no thread must be cut on the inside end of the bolt which goes through the standards, and the hole must admit the bolt freely.

The next matter for our consideration is the power tube. For this, we shall need a tube 8 in. long, and, say, 1½ in. diameter; 1¾ in. from the lower end solder a ring ¾ in. wide, and over that another as described before. Chuck the tube in the lathe, and turn down a collar with a thread chased on it to fit the arm already made.

Although for convenience in writing I have referred to the arm before the tube, yet in actual work it will perhaps be best to make the tube before finishing the arm. Whilst the tube is in the lathe, a thread must be chased on the inside of the lower end. A small casting must be made as K, Fig. 1., as a nose-piece to screw in the tube, and to take the object glass tube K'.

I will not recommend an amateur to mount his object glass, at least, if it is a good one; the better plan by far will be to send the nose-piece to a practical man, and get such object glasses as are desired mounted on tubes to fit the nose-piece.

The object glasses I would recommend are, to begin with, a 2 in., 1 in., and ¼ in. It is a great mistake to suppose that the higher the power the more any one can see. The fact is, the eye needs a lot of training before a high power can be used with great advantage. Beside which, with a high power a very small portion of an object is seen at once, which to the unskilled would be meaningless; whilst with a low power a large field is presented and a moderately large object can be taken into view at once, which to the amateur microscopist is both more interesting and instructive. Even a 3-in. object glass is a useful power with some objects.

We must now proceed with an eye-piece. These, like object glasses, are of different powers, known generally as A, B, and C. An optician would supply the power needed. We need 1¾ in. of tube that will slide easily into the power tube. If it is slightly too large, it can be turned down; on the inside of each end a thread is cut.

We shall now need two castings. Fig. 12 gives a section of the cell for the field lens. At *b* is seen a small ledge or gallery; this is for the lens to rest on; this need not be more than the 32nd of an inch thick. At *a* the brass must be turned away until it will bend easily. Chase a thread on the outside and inside; the thread on the inside is for the purpose of attaching a polariscope to the eye-piece. When the cell is finished, it should be large enough to take the field lens without pinching. Chuck the cell with *a* at the right hand, place the lens in position, some one steadying it with the end of a clean finger, turn the lathe slowly, and with a burnisher turn the edge over on the lens, as shown in Fig. 9. The cell for the eye lens must have a slight increase of thickness around the hole; this is to allow of a bed being turned out for the lens. The brass will be turned away so as to allow a ring to stand around the lens for the purpose of bezelling it. In the focus of the eye lens a stop must be placed as shown, with a central hole two-thirds of the diameter of the lens.

The next work will be to fix a mirror. Fig. 8 will give a plan of this. A mirror in a cell can be purchased from 2s.; it would therefore be unwise to buy simply the mirror and make a cell—it would not be worth the labour. Still, if one purposes doing so, proceed as follows:—Cut off a ring ½ in. wide from a tube large enough to admit the mirror, turn the ends true and cut a thread on the inside of one end, and solder a bottom to the other, letting the edge of the bottom project far enough to mill it. A ring with a flange must be made to screw into the cell; the flange edge must be milled. Place a little cotton wool in the cell on which to lay the mirror, and screw on the ring. In the diameter of the cell two small hollows must be made with a fine-pointed centre punch.

A collar must be made to slide on the focussing tube *b*, Fig. 1. This can be made of tube that will hardly go over the other; put a saw cut in it. The spring will now allow it to go on, and at the same time will grip it firmly. The clip should be ½ in. wide. In the centre, as at *b*, Fig. 8, a small stud must be screwed and soldered; this may be made of small brass tubing.

A circular arm, *c*, must be made; it should be ½ in. × ¼ in. in the centre, tapering at the ends. A screw fastens it to the stud. A washer should be placed under the head of the screw. Screws pass through the ends; these are pointed, and enter the centres which have been provided for them in the cell.

The mere mechanical part of the work is now finished. The various parts must be polished with rottenstone and oil; not a trace of a scratch must be left, the whole being lacquered. This is a difficult job for an amateur; a hint or two perhaps may be helpful.

After they are polished they must not be fingered, as finger marks will show when the lacquer is laid on. They must be heated as hot as the hand will bear with comfort; rather vague directions truly, but practice alone can give the requisite degree of heat. The lacquer must be put on with one stroke of the brush; no painting, as the brush marks will show.

If care is employed in carrying out these details, the result will be an instrument equal to any work which the average student will be called upon to do. It is a well-known fact that practical men, as a rule, do not employ instruments elaborate in their mechanical arrangements; these are left for wealthy amateurs, who are fond of exhibiting costly toys.

In constructing the eye-piece, I have calculated field lens 2-in. focus, and eye lens 1 in.; these are separated one-half their combined focus, that is, 1½ in.

PHOTOGRAPHIC TRANSPARENCIES.

BY DAVID ADAMSON.

AMONG my acquaintances are some who go in for photography. As is not unusual, they are "photographic mad," a common complaint amongst amateurs; or, stated in other words, they are enthusiastic votaries of the art of photography. Strange and wonderful attempts some of them make in the higher branches of the art before they have mastered the rudiments. They want to make beautiful transparencies before they can manage to take a decent negative. Occasionally they get one which is fit to be seen, and when they can make two or three good ones in succession they want to go ahead. Far be it from me to dissuade any beginners from their laudable desires to make progress; only I think they would often get on better in the long run by remembering that we must creep before we can walk. It is no doubt a strong temptation to many of us when we read of the beautiful results obtained by skilled workers to try and do likewise, but experiments run away with both time and money needlessly, when undertaken without sufficient experience to warrant a reasonable prospect of their being successful. However, this has not much to do with the subject of the present article, though it all leads up to it, and transparencies made on the ordinary albuminised paper may well be recommended for the consideration of those who are as yet not equal to the task of producing them on glass. Nothing more than ordinary negatives and the common paper which every photographer uses more or less, and beginners solely, for printing purposes are required—of course, with the necessary chemicals as well. To produce such transparencies no difficult manipulation, requiring great nicety in application, is called for. They can, in fact, be produced by any one who can take an ordinary photographic print, no more skill or expense being necessary for one than for the other.

As every one who has given his attention to even the smallest extent to transparencies knows, on glass they must be much more dense than an ordinary negative, and

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for this reason special plates for transparencies are made and sold. The same rule holds good with regard to silver print transparencies. The print may be quite right seen in the ordinary way; it may even be a trifle too deeply printed; but on rendering it translucent, and viewing it by transmitted light, it will be found wofully thin and poor-looking. However well it looked before, it does not do as a transparency. This thinness, I take it, is the chief reason why the plan of making transparencies of silver prints has not found more favour among amateurs who wish to adopt easy methods of work, which, without being so good as the processes which in skilled hands are found the best, shall yet afford fair results.

I do not know that the process by which dense silver prints may be obtained is any novelty. For aught I am aware, it may be a well-recognised plan, though it can hardly be called a well-known one. So far as I am concerned, I found it out accidentally. One day, inadvertently, a piece of paper was put in the frame with its unprepared side in contact with the negative. On examining it in due course this mistake was discovered. On the sensitised side a print much as usual, only fainter, showed itself on the other—the side next the glass. The print was also distinctly visible, but details were not well defined. The effect was peculiar, and not altogether pleasing. However, the print being partly formed, it was left for further exposure to see what the result would be, more from curiosity than from any other motive; though at the same time I thought possibly dull prints could be got in that way. I have since seen it mentioned somewhere, I fancy, by my old friend—Henry Sturmey, of cycling celebrity—that dull or matt prints can be obtained in this way; but without disputing the dictum of so well known an authority, it may be said that the want of detail is objectionable. At least, in my hands they have never shown much detail, though for broad effects they are admirable.

If I may venture on a comparison, they may be said to bear a similar relationship to prints taken in the ordinary way that a charcoal drawing does to an engraving, or a picture of the impressionist school to a minute Dutch painting.

Mentioning painting, reminds me that photographs printed on the wrong side of the paper are admirable as a groundwork for colouring, either in water or oils; but this branch of work cannot be enlarged on at present. I hope, however, to refer to it at no very distant date; so, in the meantime, attention may be confined to transparencies.

In due time the print above mentioned was toned and finished along with a batch of others. It could not be called satisfactory either on one side or on the other, though on both the picture was distinctly visible. On holding it up to the light, however, I was struck by its density. If I had been on the look-out for a dense print to serve as a transparency, the result could hardly have been happier.

With this there is little more to be said, for the way by which silver prints may be made available as transparencies has been clearly indicated. All that is required is to "make a mistake" in putting the paper in the frame. Printing takes a good deal longer than in the usual way, but it must not be so long continued as to form a really good picture on what is now the reverse, the albuminised side. It is possible to get this, but then the print is too dense as a transparency. A few trials, however, will soon show the extent to which the printing should be carried, and be of more practical use than pages of instruction.

It will be understood that the prints are to be fixed and toned in the usual way, after which they are rendered translucent and mounted.

Perhaps the best medium for rendering them less opaque is Canada balsam, thinned down with a little turpentine. I find it a very good plan to soak the photos in the latter, and then to rub them over with the balsam, leaving the print for a few hours between a couple of pieces of glass (old negatives) till the balsam has thoroughly incorporated itself with the turps and soaked into the paper. The only object of the glass is to prevent the balsam and the turps drying before all the tissue of the paper has become saturated. If they do, opaque spots soon show themselves, and do not add to the beauty of the transparency, which, when well done, should not show any granulation. Instead of Canada balsam, which is a nasty sticky stuff to handle, any of the preparations named in the recent articles on crystoleum painting may be used; and melted wax or paraffin is not to be considered as by any means the worst medium for rendering the prints transparent. Perhaps it is the most durable of the lot, though rather more troublesome than some of the others in its application.

When the transparency is ready, it may be preserved between two pieces of glass; old negatives again come in very conveniently. These are joined at their edges in the manner described by Mr. Beckerlegge in his articles on crystoleum—already referred to—and then mounted in a suitable frame. This, of course, should be the same on both sides, if it is visible from the outside of the house; for, however beautiful a transparency may be when seen from the inside of a room, the ordinary picture frame is hardly presentable as an object of beauty both in front and behind. To describe the construction of frames is, however, hardly within the scope of this paper, which, having described a process of easily making transparencies by novices in photography, has served its purpose.

It has frequently occurred to me that such paper transparencies might be made available as a magic, or, to give it its high class, first "chop" name, optical lantern; but on this point I cannot speak definitely, as I have not much acquaintance with this kind of work, or, should I say, scientific amusement? Possibly, to some of those who do, the hint may be of service, and induce them to give fellow-workers the benefit of the irexperience.

In the meantime I may, however, just suggest that the paper will form a pleasanter ground on which to paint than the glass on which magic-lantern slides are usually prepared. Of course, transparent colours only are permissible, and in considering the effect to be thrown on the screen, the colour to which the photograph has been toned must be taken into account; for example, with a brownish tone it must be remembered that strange pranks will be played with the blues and the greens with which the photograph may be tinted. This refers only to coloured transparencies, or, as they may perhaps be called, lantern slides; and it need hardly be said that if left in the plain unpainted state that they will be better than if badly coloured. While proposing the use of these paper transparencies for lantern purposes, the obvious saving in weight may somewhat counterbalance disadvantages.

PAPIER-MÂCHÉ.

How to Mould It, and how to Ornament It.

BY SYLVANUS WARD.

DECORATION (*continued*). FINISHING BUILDINGS ON PEARL—FLOWER AND FRUIT PAINTING ON PEARL—FIGURES IN PEARL—ORNAMENTS IN PURE PEARL ON COLOURED PEARL GROUND—SCRAP PEARL WORK—BRONZE WORK—STENCILLING AND DUSTING-IN.

OUR attention must now be directed to finishing subjects inlaid with pearl by painting.

Buildings in Pearl.—There are different methods by which pearl buildings may be finished; we will describe two applicable to buildings which are supposed to be in a perfect state, and a third which is considered most effective for the treatment of ruins.

In all cases, the main features of the building have first to be sketched in, and in doing this, the T-square and set-square will be found useful accessories. We will suppose this done, with the structure to be finished by our first method, and we have now to give our high lights to those parts on which the light in our picture falls most strongly—such as string courses, the fronts of buttresses, etc.; and this is done by gilding those parts with pale gold. The shadows have next to be broadly put in with transparent varnish colour. For this purpose, although the effect produced by it cannot be called a natural one, purple has been the favourite colour. The purple used is compounded of Prussian blue and carmine; or, instead of carmine, the cheaper crimson lake may be employed. After this the darker shadows are put in with a deeper shade of the same. For shaping out windows or other architectural details of the parts in shade, a little black may be added to the purple. On those parts of the building which are in light, a mere line of purple will usually serve to bring out a pilaster or any similar feature. It will thus be seen that, according to this method, pale gold serves for the high lights; the pearl itself for the middle tones; and purple for the shadows.

Or, secondly, in place of gold, flake white may be used for the high lights, life and variety being freely given to it by occasional tints and minute touches of such colours as a legitimate water-colour painter would suppose to exist in the stone, and would give to it. Instead of purple, a grey may be employed for the shadows, this also being enlivened by a little bright transparent colour, so as to give a variety of warmer or cooler greys. By this method a less showy, but a more natural and artistic, representation of the building is obtained.

With ruins it is found better to deal somewhat differently; but before describing the manner of doing so, it will be desirable to make some supplementary remarks on the actual inlaying of work of this kind if it happens to be on any considerable scale. The Gothic window, Fig. 37, will serve as an example. The masses forming the arch having been cut out in pearl, and fitted up on those which form the walls, the knife-saw must be used to cut strips of suitable width for mullions. Some of these strips, cut shorter, will also serve for those parts of the tracery which approach straight lines. Other strips, divided into small pieces, will also serve for the circular parts of the tracery, if cut and arranged, as shown in the diagram, like stones forming an arch. Cusps (the little triangular projections in Gothic tracery) are afterwards put in with pearl colour at the beginning of the painting

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process. These cusps are for distinction shown black in one-half of the figure. The angular lines of the tracery are changed into curved ones in the painting process. All this applies to Gothic windows of considerable size only; if small, they are laid in solid, and the tracery is formed by blacking out between.

To return to the method of finishing ruins. The older plan was to light with gold and shade with purple, as mentioned above; but this was abandoned for a better. Owing to their unsheltered exposure to weather, ruined walls become much more covered with mosses, and such like vegetation, and acquire much more varied colour than those which are protected by roofs. Hence it has been found that more characteristic effects are to be produced by painting in the high lights with flake white warmed up with different tints, somewhat as in the process last described, and painting the other parts with patches of varied transparent colour, blended into each other. In the half-tones these tints will, of course, be very sparingly employed, the pearl being left as much as possible to produce its own effect. It will be in the shaded parts that most colour will be used. Such pigments as verdigris, Italian pink, carmine or crimson lake, Prussian blue, or mixtures of these, are fitted for this purpose. Tube colours will doubtless be used, but they must be sufficiently diluted with varnish and turps. Ruins thus painted are best lined out with a mixture of crimson lake and vegetable black, which will form a kind of dark purple. This will not have to be confined to the shady side of the work; on the light side also a line of it occasionally, as down a pillar or the recess of a window, will be equally necessary.

Ivy or other foliage growing on such ruins may either be done in bronze powder (of which mention will be made further on) mixed with varnish, the high lights and shadows being expressed by stronger or weaker touches of bronze, and afterwards stained with transparent colour; or it may be merely painted with varnish colour. The worker has a like choice in the treatment of trees, etc., which may surround his ruin, and of the ground on which it stands.

Mention has just been made of "varnish colour." This is supposed to imply ordinary tube oil colour mixed with varnish; but the old practice of japanners was to use colour ground in turpentine, varnish about equal in quantity to the bulk of the colour being afterwards added, and the whole well mixed with the palette knife. This sets more quickly, but involves much loss of time in hand-grinding.

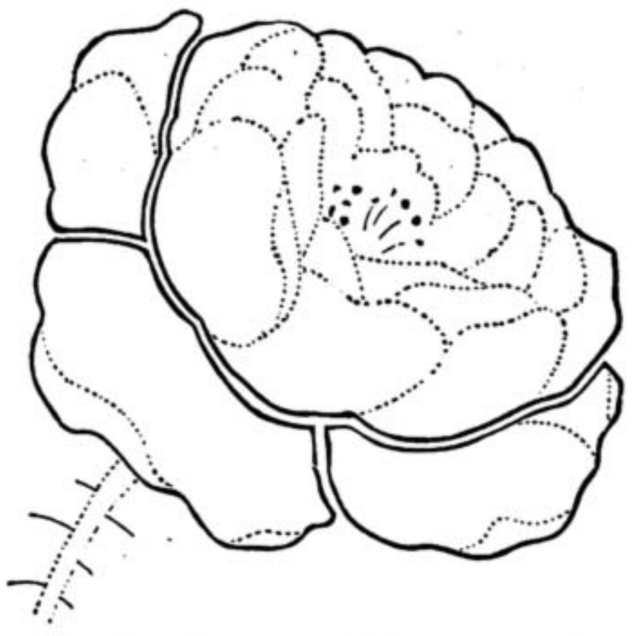

Fig. 38.—Flower Painting on Pearl.

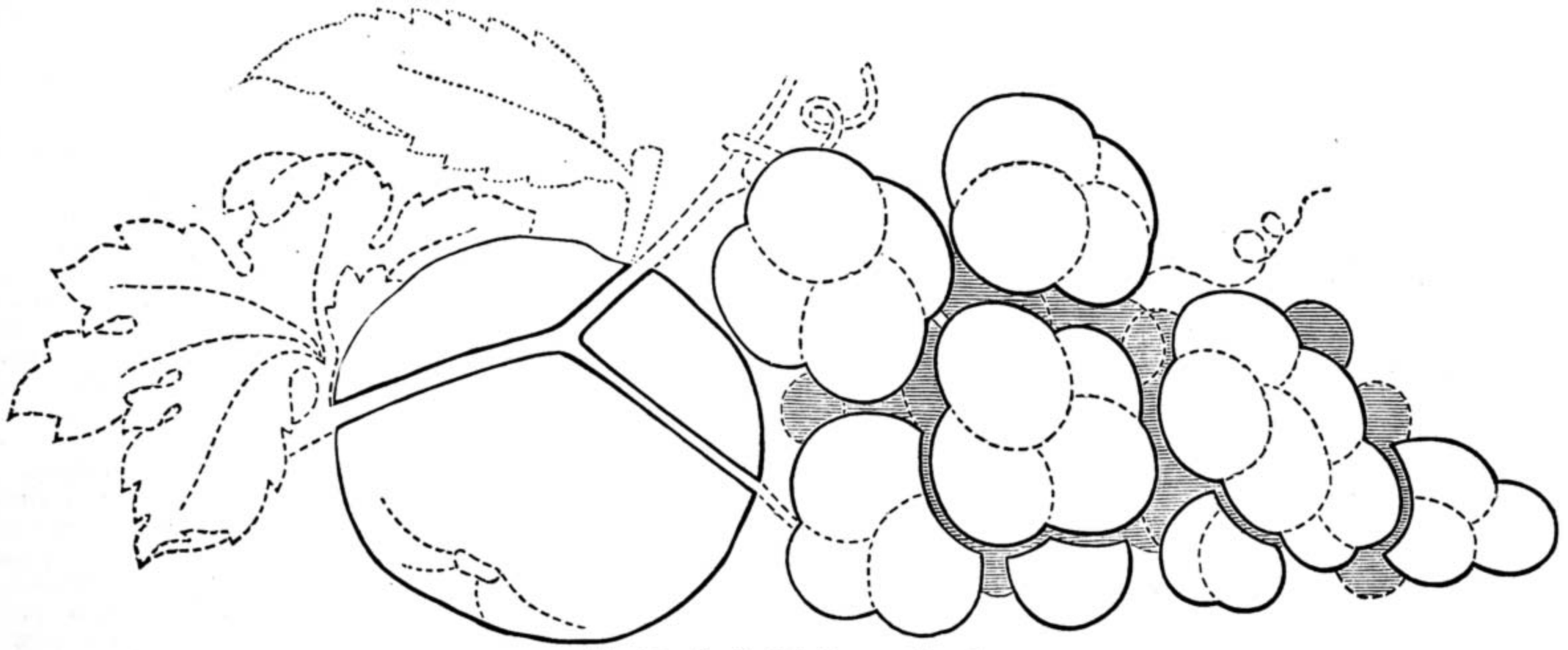

Fig. 39.—Fruit Painting on Pearl.

Flower and Fruit Painting on Pearl.—In representing such natural objects as these on pearl, it is usual to introduce leaves but sparingly, and to confine the work as much as possible to the actual flowers and fruit.

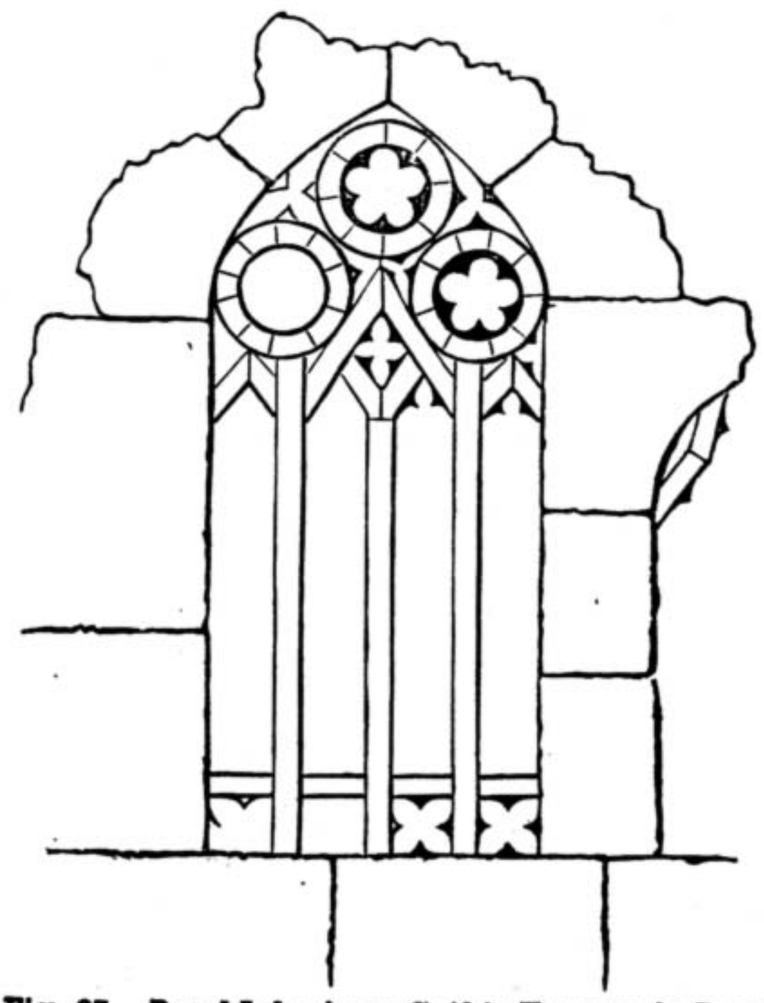

Fig. 37.—Pearl Inlaying: Gothic Tracery in Pearl Ruins.

Before inlaying, the pearl is cut with the scissors so as to suit the forms of the different parts of the group as far as may be. Flowers and fruit need but a very slight sketching-in of their more prominent features with the black-lead—indeed, a skilful workman is contented to do the sketching almost entirely with his brush as he goes on. If, as is frequently the practice, the leafage and stems are to be in gold or silver, this gilding or silvering should be done first.

We will assume that we have a flower group to paint, in which is a rose (red), a horn-poppy (yellow), and a convolvulus (blue). Our flowers have been cut out and inlaid in pearl, as may also probably be a leaf or two, to make the composition balance, for in work of this kind the pearl asserts its importance, and first and chiefly strikes the eye. The balance of pearl in a composition has therefore to be duly considered. Our stems and leafage generally have been gilt. Our less important buds we may perhaps have laid in with silver, but we shall probably content ourselves, as regards them, with flake white only.

But here it should be noted that if, for want of sufficiently large pieces of pearl, our rose or other flower has to be inlaid in more pieces than one, the divisions should be made to coincide with the outlines of the petals, as exemplified in Fig. 38. To render the joinings as little apparent as possible, paint them over with pearl colour, or, what is still better in flower or fruit work, before beginning the painting process, go over the joints with varnish, in which a spot of oil is mixed, and stump over with white bronze.

But to proceed with our painting: beginning upon our rose, we take a brushful of thin transparent varnish colour, and put in a broad wash for the middle of the flower, letting the colour flood towards the centre where the greatest depth is required. With the same colour we go over the under part and other portions which are in shade. Then we slightly define those petals which are in light. Mixing ultramarine with our varnish, we now paint in the convolvulus to the same stage; and that done, with Italian yellow (usually called Italian pink) we make like progress with the yellow poppy, and such parts of the convolvulus as may require this colour.

While the flowers dry we shade down the gold stems and leafage till they appear to

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recede into their proper places. For the stem of the rose we shall use burnt sienna, with perhaps a little crimson lake added, and vandyke brown for the deepest shades; while the leaves will require verdigris, Italian pink, burnt sienna, and vandyke brown.

When the flowers are sufficiently dry, we shall proceed to paint them up, using a drier colour and one of deeper hue than before. A firm line or touch of flake white tinged with crimson lake, if used in finishing, will be found to bring up the high lights effectively without interfering with the brilliancy of the pearl.

The treatment of fruit on pearl is much the same as that of flowers. As may be done with flowers, the stems and leafage may either be inlaid, or gilded, or merely painted, as best suits the composition and the taste of the worker. Some of the difficulties of fruit inlaying are dealt with in Fig. 39. It will be obvious that an entire bunch of grapes would be too large to be formed of a single piece of pearl, and the usual method of procedure is that shown, the pieces of pearl being marked out by a continuous line, whilst the individual grapes are bounded by dotted lines. Some two or more grapes adjacent to each other, or perhaps single grapes if they come near to the eye, are inlaid with separate flakes of pearl, whilst more distant grapes—shown as shaded in the diagram—are merely painted in with pearl colour in the intermediate spaces. The apple is also so large a fruit as to present difficulties. One way of meeting these is that shown in the diagram, where a grape-stem is brought across it, so as to conceal the joinings of the three pieces of which it is composed. Another way is, in a streaked apple, of hiding the joining by a streak. These joints have, of course, to be covered with pearl colour or white bronze, as mentioned above in connection with the rose. A third way is by inlaying so much only of the apple as will serve for the half-tones, and trusting wholly to painting for the high lights and shadows.

Greek and Etruscan Figures in Pearl.—Statuary and the flat figure compositions on antique vases are well suited for treatment by pearl inlaying. The figures are cut out in the pearl, the outlines being afterwards corrected with black, whilst black lines are introduced to indicate the features, drapery, etc., wherever needed. Groups of flowers and fruit have sometimes been treated in a similar manner with black lines only, the finer stems, etc., which are too delicate to be cut in pearl, being merely laid in with paint.

Ornaments in Pure Pearl on a Coloured Pearl Ground.—Such ornaments are most readily produced by painting over the whole surface of the pearl with the grounding colour, which may be purple, yellow, or any other which is

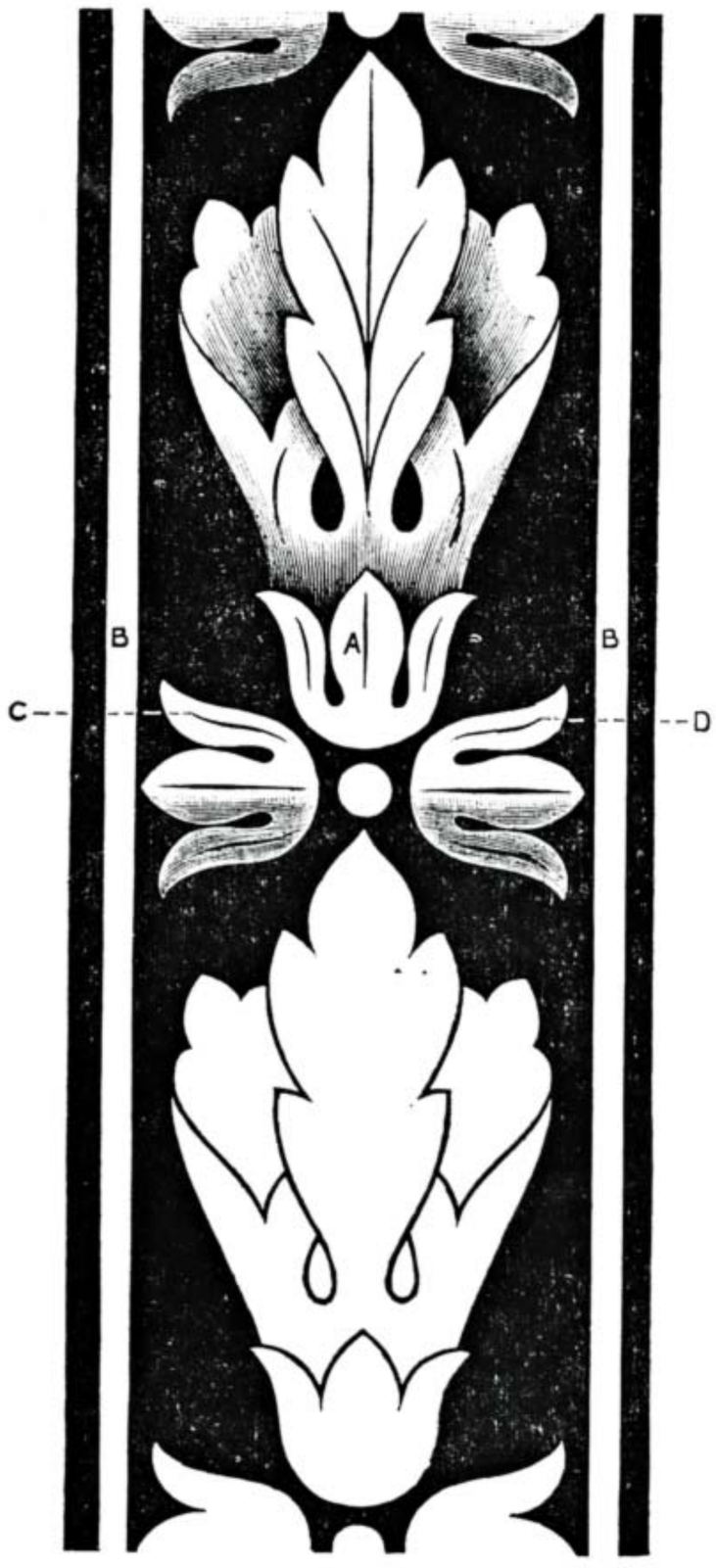


Fig. 40.—Bronzing.

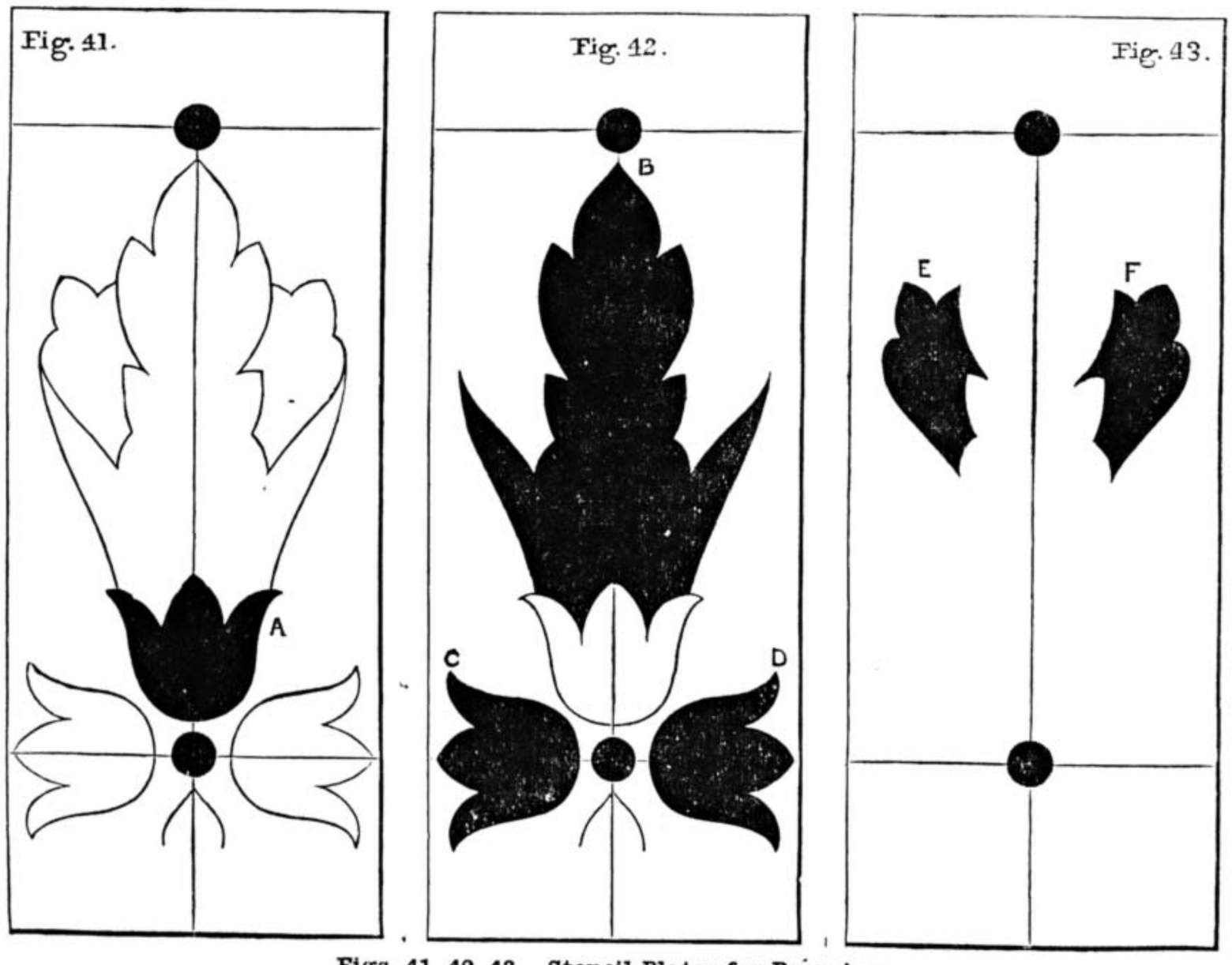
desired, a little oil being added to the varnish with which the colour is mixed, to make it set more slowly. On this, before it is thoroughly set, and as soon as it is dry enough to work upon, the required ornament is painted in *oil* flake white laid on freely. This is allowed to stand so long as will suffice to soften the ground colour beneath, and is then wiped off with a little pad of cotton-wool, the pad being tightly squeezed together, so that no fluff may come off it. The flake white brings with it the grounding colour, and the ornament is thus left in pure pearl, as desired.

Scrap Pearl Work.—The scraps of pearl which accumulate from inlaying may occasionally be used to good purpose for filling formal spaces in ornamental designs. The method is to fit them in quite at random, and then to stain them with different transparent colours. Simple as is this work, it has a very pleasing effect. Scraps of pearl may also be used for foliage of trees, in connection with inlaid ruins, connected and worked up with gold dotting or pencilling; or in other cases with dots of green or autumnal tints.

Bronze Work.—We now come to a highly-interesting method of decoration, and one which, in the hands of an ingenious decorator, is applicable to many other materials than papier-mâché, and that is by bronze powder. Somewhat more than half a century ago, bronze powders were extensively employed in the decoration of papier-mâché; not in the rude and hasty way in which we now see them applied to iron goods, but in ornamentation of a higher and more elaborate character, by means of a kind of stencilling and dusting-in process. The bronzes used were chiefly pale gold, deep gold, copper, flesh, orange, green, and silver bronzes. Landscape and figure subjects were sometimes carried out in this work, and these required in addition a "pencil bronze," *i.e.*, bronze mixed with copal varnish into a kind of paint, and applied like paint with a brush. The bulk of the work in bronzing was, however, done by stencilling and dusting-in—a process requiring no particular skill or knowledge, only care and exactness.

Fig. 40 is a design for this work, and the first step towards carrying it out will be to cut from stiff, but not thick, paper three stencil plates, as shown in Figs. 41, 42, 43, where the portion to be cut away is given in black. These will, of course, be traced for cutting from the design. A band as wide as the design extends has then to be sized with gold size on the black ground of the article, and allowed to get nearly dry, much dryer than for gilding, for the slightest tackiness suffices to hold bronze powder; and if the sizing be not dry enough, the stencil plate is apt to adhere and make difficulties.

The part intended to be solid bronze will have to be first dusted in through the stencil plate. This will be the husk A in Fig. 41. And here it should be noted that when two forms are close together on one plate, as are this husk and the round dot, it is not necessary to stencil both with the



Figs. 41, 42, 43.—Stencil Plates for Bronzing.

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same bronze. One of them, in this case the dot, may be masked with a piece of paper; the mask being afterwards moved, and the second form dusted with a different colour. In the present design the husk will be solid copper, and the dots solid gold bronze. It should also be explained that the dots are cut through in *all* the stencil plates, that they may serve as a "register" or guide by which to lay the different plates with accuracy upon the work. Thus the first plate being done with, the second plate (Fig. 42) is adjusted so that the dots already laid in shall exactly appear through the openings which correspond to them; but the operation now to be performed is somewhat different from the first. The bronze is not now to be laid in *solid*. A very little gold bronze is taken up with a *dry* hair pencil and dusted on, beginning nearly solid at the top of the form (B), and growing gradually less solid towards the bottom by diminishing the quantity of bronze in the brush. This will produce a sort of shading, dying away towards the solid husk A. Then, changing the hair pencil, we take up a little copper bronze, and in like manner dust in the two husks C and D, which are to be made nearly solid at the points C and D, but shaded off below. Then removing this second stencil plate, and, instead, adjusting the third, Fig. 43, we make the dots register as before; and with a third bronze—say, orange or green—dust in the parts marked E and F, shading them as before, as is indicated in Fig. 40. The pattern is now complete, except as regards the two straight lines which bound it. These have to be drawn in, after the stencil work has been well dried, with gold size—by hand if the worker has the requisite skill; or, if not, by stencilling, and rubbed in solid with bronze; if drawn by hand, these lines are generally gilded.

After the whole of the bronzing process is completed, the black fibres and lines necessary to complete the pattern have to be put in. A person skilful in the use of the brush will do this with his "etcher" and black oil paint mixed with varnish. One who has not that skill may adopt instead a process known as "scratching up." This is done with a sharp-pointed piece of steel, by which the bronze and gold size may be removed, and the black ground exposed wherever a stroke is taken. This should be done before the work is quite dry. For the advantage of the little-skilled worker, it may be observed that "scratching up" may also be used in connection with dead gold and silvering; the effect, however, is never so good as that of lining with the brush point.

It will be seen that this bronze-work is a process far too valuable to be allowed to sink into oblivion. Its simplicity recommends it to the attention of only moderately skilled workers, and bronze offers a considerable variety of colours, each of which may be dusted in so as to form shading of the most delicate character. There are many purposes to which it might be applied beside papier-mâché work. Cabinet work suggests itself to the writer as one such purpose, the decoration being there applied on a black ground.

Thus far I have ventured to carry the reader in the preparation and decoration of papier-mâché work, and another brief paper will bring my instructions to a close. I can only hope that what I have said will prove suggestive in other ways for the ornamentation of household furniture.

"TIPS" FOR TYROS.

BY OPIFEX.

Bushing worn Wood Chucks.

Sometimes a wooden chuck which may be a favourite becomes so worn that it cannot grip the nose of the mandrel. I have found the following plan work admirably, and although it may not be new, I have never known of its being done, and give it for what it is worth. Heat the inside of the wooden thread with a hot iron, and give it a rather thin coat of cycle cement; now cut a piece of thin sheet brass, as used for covering curtain poles, etc.—*i.e.*, about as thick as stout paper—and sufficiently large to cover the inside of the hole in the chuck, and allowing about ¼ in. over. While the cement is hot press the brass in, and screw on the chuck tightly into its place; unscrew in a few minutes, and you have a perfect bushing of brass in your thread. Wipe off any cement which may adhere to the surface of the metal, and you will find that your chuck will have obtained a new lease of its life.

Colouring Brass.

Repoussé workers, etc., should know that they may colour their own work, and thus save themselves the trouble of having either to hunt up a professional or do without colouring at all, in which latter case the appearance of even the best work is spoiled.

The brass must be perfectly free from grease of any kind. To ensure this, wash well in very hot water with plenty of washing soda and a stiff brush, and rinse in clean cold water; drain off, and when dry dip the metal for two or three seconds into a mixture of two parts nitric acid, one part sulphuric acid, adding a very small quantity of common salt. Remove quickly, and plunge into a large vessel of clean water; rinse well, and dry in hot beech, or boxwood, sawdust. A tin biscuit-box, etc., suits well for keeping and heating sawdust in. When the brass is placed in the sawdust move the box about until the metal is dry, when it will be found to possess a beautiful, rich gold colour.

Avoid touching the brass with the fingers, as the least taint of grease will spoil the after process of lacquering.

The operation of dipping should be carried out in the open air, or in a specially ventilated room, and the fumes of the acids should be avoided, as they are most injurious; but if ordinary care be observed, there is not the least danger to be apprehended.

Brass wire, or a brass tongs, should be used to hold the article while dipping, and there must be no stint of water in the rinsing.

In case acids are not available, a fairly good gold colour may be imparted by boiling in a strong solution of pearlash, or even washing soda, care being taken to plunge the work into water before it has time to dry, *i.e.*, *instantly* upon taking it out of the pearlash, etc., otherwise it will become stained.

Should it be desired to brighten any portions of the work by burnishing, this should next be done, a piece of clean paper being kept between the metal and the worker's hand.

Lacquering Brass.

The object of lacquering brass work is not to improve its appearance by imparting lustre, but to retain as much as possible of the lustre it already possesses.

In fact, the process detracts from the appearance of the newly-coloured work, as every worker knows who can appreciate the beauty of the metal as it comes from the water after "dipping," or from the sawdust when dry. But it is "too fair to last," and if exposed to the atmosphere for any length of time, would become dull, and finally black. However, a thin coat of spirit varnish, or "lacquer," will serve to protect the surface from the air, and the result is that the metal preserves its colour and lustre for years.

"A thin coat of lacquer!" how simple it *sounds*, yet there are few things harder to do—at least to do well; and many an amateur, and professional worker too, has experienced heart-burnings, as well as finger-burnings, in his attempt to acquire the art of lacquering.

The work, when finished and coloured, is slightly heated by placing it on a hot metal plate. It is then given an even coat of lacquer, using a broad camel's-hair brush, and being careful not to go over the same spot twice, but beginning at the top of the work and holding it so that the lacquer, supplied and guided by the brush, shall run down and over the metal. This requires practice, as owing to the brass being hot the volatile varnish quickly dries, and if the brush passes a second time over a spot where the lacquer has, even partially, "set," the result will be a brown seam, which, in a most provoking way, invariably appears upon the most important part of the work.

When this operation is satisfactorily accomplished the metal is heated, considerably more than before, until the lacquer is dry, but the amount of heat should never be greater than can be borne by the hand—applied to the back of the work—else the lacquer will be burned.

The brass is now let stand until quite cold, when it may be handled with safety.

The above is the usual method of lacquering, and, as before observed, appears a simple process *on paper*, but it is far from being so in practice; and the present "tip" consists in this, that as the chief difficulty lies in the fact that the metal being hot the lacquer dries very quickly, this difficulty may be obviated by applying the lacquer to the *cold* brass, allowing it to dry spontaneously, and then giving another coat. Do not mind if the first coat becomes milky, but, having applied the second, subject the metal to heat, as before directed, when it will dry bright and clear.

Utilisation of Old Negatives.

Amateur photographers often don't know what to do with old or spoiled negatives, and sometimes need a greater number of printing frames than they possess.

The connection between these two facts consists in this—that the old negatives may very easily be turned into printing frames, or rather printing contrivances, for there is no frame needed; but we will call them frames for convenience.

To make a printing frame for half-plate photos, we only require two old quarter plates. Cut a piece of strong black linen a little larger than two quarter plates placed side by side, and paste them down securely in that position to the linen; place this on a flat surface, and lay a heavy book, etc., upon them until quite dry; then trim off the linen to the exact size of the glass with a sharp knife.

Next procure four spring clips, as used for fastening clothes on a line, and the printing frame is ready for use.

To make a print, place a piece of sensitised paper of the required size upon the

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negative, and then a piece of white blotting paper, half-plate size, upon the back of the print. Next lay the quarter plates hinged with black linen, glass side down, upon the blotting paper, and secure with the four clips, placing two at each side of the frame, so that each half of the folding back shall be firmly held in position. The print may be examined by removing the clips from one end and raising the half, as in the case of an ordinary printing frame.

For carte-de-visite size, a quarter plate cut into equal parts, and for printing from whole-plate negatives, two half plates, backed with linen as above, may be used; for the larger sizes eight clips will be required in order to ensure perfect contact between the print and negative.

OUR GUIDE TO GOOD THINGS.

76—Gaseous Fuel: Its Production and Application.

Readers of Work who are interested in the production and application of gaseous fuel, including water gas, will derive much information on the subject from this little volume, which is the reproduction in book form of a lecture delivered at the Association Hall, Peter Street, Manchester, on March 29th, 1889, by Mr. B. H. Thwaite, C.E., author of "Our Factories, Workshops, and Warehouses: their Sanitary and Fire-resisting Arrangements;" "Liquid Fuel: its Advantages for Steam-raising Purposes;" "Mill Engines," etc. Opening with strictures on the national waste involved in the consumption of solid fuel, the writer calls attention to the vast subterranean stores of natural gas, whose discovery and application to various manufacturing purposes for which coal is now used in this country has transformed the black and smoke-stained region of manufacturing industry in Pennsylvania into one almost as pure as those parts in which agricultural pursuits predominate. This is followed by a brief reference to the Aspheron Peninsula and other places in which natural gas has been discovered and utilised, the chemistry and composition of natural gas, known to miners as firedamp or marsh gas, its origin and geographical location, the method of drilling a natural gas well, and the distribution, transportation, and application of the gas itself.

Space forbids any attempt to summarise the contents of the volume throughout, and it must suffice to say that it is brought to a conclusion by a statement of the author's project for distribution of gaseous fuel produced and distributed at the different coal fields of the United Kingdom, the supply for the metropolis and the midland towns being derived from three gaseous fuel-producing installations—one in South Wales, one in Staffordshire, and one in South Yorkshire.

"The coal," says Mr. Thwaite, "would be converted into gas at the coal fields, and delivered to the distributing mains under great pressure by means of compression engines, and could be distributed in the towns in the daytime for heating purposes by the ordinary mains, and by means of special incandescent burners the gas could be utilised for illuminating. The saving in cost of fuel by this system in its application to the metropolis will be understood from the fact that, in the year 1887, 12,055,000 tons of coal were delivered into the London district. The total cost of this coal at the coal fields would be fairly estimated at £3,013,750; the amount paid by the London populace for this coal would be about £12,657,750 per annum. The difference between cost of fuel at the source of supply. and at the place of use is, therefore, £9,644,000. This amount is absorbed in cartage, merchants' profits, railway carriage, and London Corporation dues. Assuming one third of this amount represents the reduction in the price of fuel to the consumers, this would leave a balance of £6,429,324 to pay for cost of generating gas and interest on capital invested on plant and pipe lines and maintenance. There is little doubt but that the net profit would justify an expenditure of fifty millions sterling in gaseous fuel installations and distributing pipe lines.

"The advantage to the metropolis by the general distribution and application of gaseous fuel would be a colossal one. The increasingly heavy and dangerous fogs, which are greatly due to the condensation of the aqueous vapour on the atoms of unburnt carbon and sulphur, would soon disappear. The splendid architectural monuments of modern Babylon would be relieved from their dirty covering, and London would be metamorphosed, and might rival Paris in the clearness of its atmosphere, after allowing for the different climatic conditions."

Such are the writer's views of the economy of the substitution of gaseous fuel for coal in all large towns and its results, as applied to London. Nothing could be more desirable than the removal of all products of combustion, or rather, of non-combustion, which permeate the air in all manufacturing towns and large areas, overspread with buildings and dwelling houses, closely packed together and extending their serried ranks of streets for miles and miles towards every point of the compass as in London. Whether they can be, or ever will be, realised, remains, in all probability, for a future generation to determine, as there seems but little inclination at the present time to move in the direction indicated.

It only remains to say that an appendix shows the value of ammonium sulphate, which could easily be recovered for utilisation as a valuable manurial agent, if the fuel now used in the form of coal was converted into gaseous fuel at the coalfields, to be conveyed thence for heating and illuminating purposes, instead of being burnt in furnaces, stoves, and open grates. He also gives analyses of chimney gases, resulting from tests and trials of boilers, heated in the one case by ordinary steam coal, and in the other by gaseous fuel, the results in the former showing a solid carbon percentage, by weight of smoke, of 4·18 per cent., while in the latter they showed absolute immunity from combustible or unburnt gases and smoke. The superiority of gaseous over solid fuel in the metallurgic operations is also shown, and some valuable notes on water gas are added. In these the relative thermic values of producer gas and water gas are shown and contrasted, and it is clearly shown in what point the real value of water gas is to be found—namely, in its high thermic character per unit volume, the ratio of thermal units in any given equal volume of producer and water gas being as 60·8 to 277 in favour of water gas. This portion of the appendix is doubly interesting at the present time when public attention is being called to water gas, and its merits, in point of cheapness of production, are being strongly urged. The book, it should be said, is published by Messrs. Whittaker and Co., 2, White Hart Street, Paternoster Square; but the publishers have omitted to state the price, which should always be named, whether in the case of book or mechanical appliance, as it is useful in assisting the reader to determine whether to buy or not to buy.

The Editor.

SHOP:

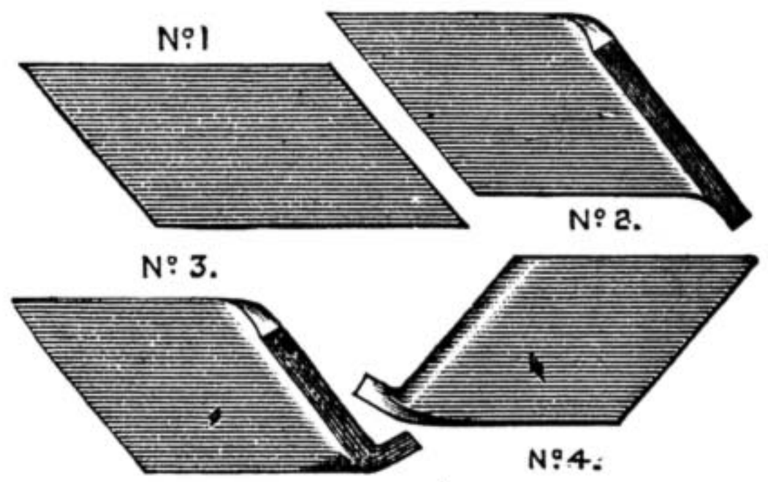
A Corner for Those who Want to Talk It.

*** Notice to Correspondents.—*In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number of* Work *in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given. Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

I.—Letters from Correspondents.

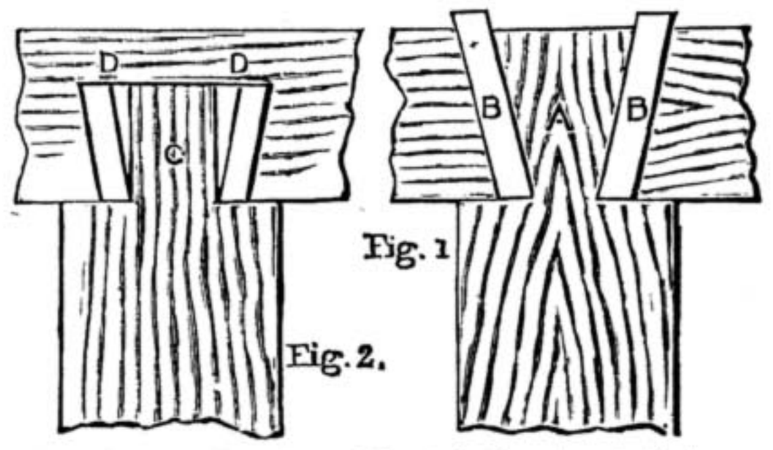
A Warning Note.—Thomaso writes:—"Your 'Shop' is increasing in size remarkably quick. If it goes on increasing at the present rate, we shall have nothing but 'Shop;' and it will probably become necessary at no very distant date, to commence that important section of Work about the middle of the previous week. As to the quality of the 'Shop' talked, well, it seems as if somebody had 'cribbed' the editorial trumpet, and taken it on a provincial tour. This surmise receives a certain amount of confirmation from the fact that you do not perform on it yourself; the loss of the instrument probably accounting for this. It is quite clear that it has not fallen into good hands. Some toot away at it until they get quite light-headed, and write hysterically, a style of composition which makes any man of feeling blush—for the writers. Others blow so gently, that one quite marvels at their taking the trouble to write at all. Then there is the 'toot patronising;' the writer graciously intimating that he is 'pleased' with Work. This class of correspondents is obviously composed of those to whom adulation is unpleasant; but I suppose they eel bound to conform to the prevailing custom, and may even labour under the impression that an answer to their query will not be forthcoming unless they use a little soft saponaceous matter. Absurd! There is just one thing more I wish to refer to—*i.e.*, the enlargement of Work. Now, it is a striking circumstance, and one by which I justify this letter, that the 'tooters' are practically the only persons who clamour for an enlargement! Therefore, hearken unto me, ye disinterested trumpeters! When you write, have less to say about 'admirable magazine,' 'brilliant staff,' 'lucid style,' 'just what was required,' and other platitudes, however appropriate they may appear. By so doing, several columns weekly might be saved. Come, now! don't you think you have had a good innings? Give the Editor a chance of adopting a really practicable plan for the enlargement of Work."

Glazing Without Putty.—Delta writes:—"Take 5 lb. sheet lead, cut into strips ¾ in. wide, then with shears clip into slips like No. 1; next place about ⅛ in. in vice; bend over and hammer into shape No. 2 with a light hammer; take out of vice, and with pliers bend point down as in No. 3; trim point with shears to thickness of glass, punch hole for tack (¾-in. copper preferred) with sharp-pointed awl—that known as a saddler's awl I use—and the



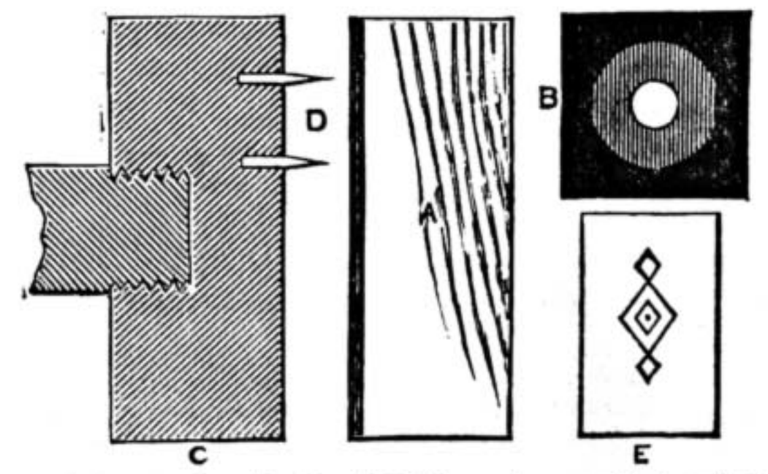
clip is complete. No. 4 goes through the same process, but is bent in the vice in the opposite direction for other side of bar. Two of these clips are sufficient for sheets of glass 12 in. by 18 in.; the top of last sheet in glazing is, as a rule, let into a groove in the ridge board. The bars may be prepared for glazing either with a bed of soft putty or a coat of very thick white lead paint. A dozen of these clips might be knocked out while writing this description, and one square foot of sheet lead will turn out about three hundred clips."

Firm Joints for Woodwork.—Artist in Wood writes:—"I send you two sketches of firm



joints for woodwork. Fig. 1 is the dovetail tenon, A the tenon, and B B straight wedges. Fig. 2 is the dovetail mortise. The taper wedges are placed in the end of tenon, and driven in by coming against the bottom of the mortise."

New Machine Tool for Making Inlaid Centres.—Artist in Wood writes:—"In this



machine tool, B is the inlaid centre, and C and D constitute tool for making it; A is a block of wood

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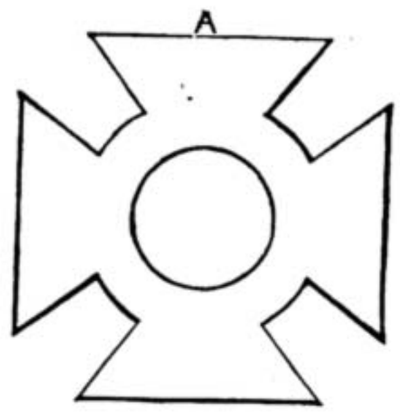
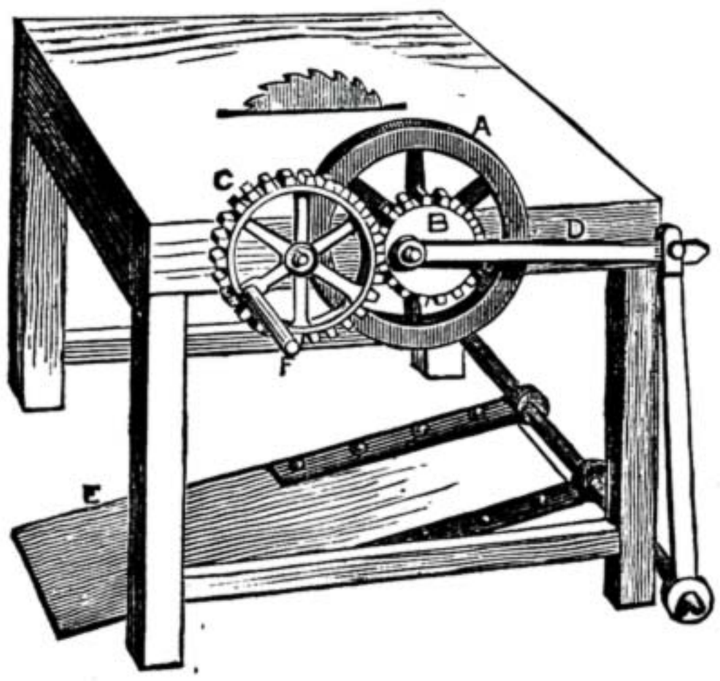
with veneer pasted on it ready for cutting. In E is shown the way of using the inlay for centres of panels. File the cutters thin, and to a bevel point, cut just through the veneer, and no more, having three sorts of wood, and change the colours."

Machine Tool for Working Beads, etc.—ARTIST IN WOOD writes:—"The following sketch of a machine tool that I use for working beads and mouldings in hard, cross-grain wood, is made



from a solid block of best tool cast steel. The part marked A is filed to fit the form of mould required; they are very useful for grooving to receive inlaid lines; they are just the thing for art furniture makers."

Powerful Rip Saw.—ARTIST IN WOOD writes:—"I send you a sketch of a powerful rip saw; it will cut very easy up to 2½ in. thick. A is a fly wheel, 50 lb.: B, cog wheel, 7 in.; C, cog wheel, 19 in.; F, handle; E, treadle; D, rod, to fit pin on B wheel. A and B wheels fit on saw spindle; crank pin on B wheel is 2½ in.; if wanted for heavy work,



A, wheel, may be 60 or 70 lb. The treadle has only about half the rise and fall of the common treadles; a 10-in. saw is the best size to use for light work: C, wheel and handle, will not be wanted. It should be made so that it will take off."

Denham Bros.' Patent Filler, etc.—J. W. M (*Halifax*) writes:—"I have great pleasure in recommending a remedy for sweating in French polish to your correspondent, T. A. (*Belfast*), whose inquiry appeared in WORK for June 1st, but which I failed to notice at the time. I am a practical cabinet-maker, and in common (I suppose) with all others, have had more or less trouble with sweating. For some years past I have had my polishing done by the firm whose circulars I enclose, and since they began to use their patent filler—about two-and-a-half years ago, I believe—there has been no sweating whatever, in any part of the work they have done for me. The printed matter enclosed will sufficiently describe the preparation, and I need only add that I have no interest whatever in the matter, beyond a desire to act on Charles Kingsley's advice of 'Helping when we meet 'em, lame dogs over stiles.' I am much pleased with your new venture, upon the whole, and wish you every success. Your article on 'Circular Saw Rigs for the Lathe,' was particularly helpful, as I was just at that time rigging up a saw for some special work. In the course of my efforts I evolved one or two notions all out of my own head, which, I think, might be of use to your readers, and if you will allow me I will try to write a supplementary paper on the subject on approval. Messrs. Denham inform me that their preparation can be bought in Belfast."—[Reference to Messrs. Denham, Bros.' patent filler has been made in the present No., page 350. I am glad to find that the paper on "Circular Saw Rigs for the Lathe" was useful to you. I should like to have the paper you propose, on approval.—ED.]

About WORK and Watches.—DEAN FOREST (*Mitcheldean*) writes:—"I beg to thank you for the answers to the questions I asked some weeks ago on hard soldering, which were answered in the 'Shop' column of WORK. I may say I had tried to obtain the one or two 'tips' which AUROLECTRIC gave me in his answers for a long time and in many ways, but unsuccessfully. I would, therefore, say that WORK has my best wishes as well as it has of those who have already paid it so many compliments, and given it so many good wishes. But I should like to see it enlarged, so that we might have a larger supply of 'good things' every week. In Nos. 16 and 17 I notice with pleasure the paper on 'An Overmantel Clock Case,' written by J. H. Moody, and I trust that many may profit by it, as I am sure they will. But if you will allow me, sir, I will take a step more than J. H. M., and advise any of my fellow-readers of WORK who are in the possession of the movement of an old verge watch to try and turn it to good account by making it into a timepiece, which it is very possible for anyone who can work a little in metal as well as wood to do. Of course it would be somewhat more difficult than our friend J. H. M.'s construction, but nothing worth the mentioning to those who are used to overcoming difficulties. I give this suggestion to any who may care to act upon it, because, having one in my possession at the present time, and knowing that a verge movement when put to such a use will often prove a fairly good timekeeper, I think that this would be putting it to a better use than it is put to when, through being unable to compete with our modern watches as a correct timekeeper, it is, as it were, thrown out of the race, and gets cast aside either to be practised upon by one of those persons who seem to be in possession of a faculty for taking constructions (mechanical and otherwise) to pieces to see 'how they are made' (after which that which might have been made useful is often made useless through various of the works being bent, broken, or lost), or else to be sold for a small sum to a watchmaker. I therefore throw out this hint to those who will receive it, knowing that even in the construction of a small timepiece like what I refer to there is plenty of scope for the exercise of some of the talent possessed by many of WORK'S readers in construction and ornamentation."

Protection of Wood and Metal from Weather.—J. C. K. (*Paris*) writes:—"Mr. Heald, of San Francisco, is like the man who went to Greenwich for the first time: he claimed that he had discovered Greenwich. Mr. Heald has found out what has been known for ages, ever since turps was mixed with pigments for paint to protect wood and metal from the weather. One part linseed oil, three parts turps and red-lead, white-lead, sulphate of copper, or any powder of minerals, is the common priming coat of paint everywhere. Mr. Heald should remember the old saying, 'If you don't know, ask.' I ask the painter."

Hollow Metal Work.—TINNER (*Stockton*) writes:—"Being a reader of your weekly paper, WORK, I noticed under the heading of 'Hints on Hollow Work in Sheet Metal,' in which you say plumbers and silversmiths are interested; you do not mention tinners, who have all kinds of hollow work to do, such as kettle tops and lids, pan lids, and copper balls for cisterns. This is only hammered on polished heads to be planished, or to be made hard; it is hollowed on a block of wood with a rounded hammer, called a blocking hammer, and can be annealed afterwards if required. The way you describe will be a very long and tedious job, and will require a lot of practice before it can be done properly. The other will be found the quickest and easiest way for an amateur. I wish you every success with your valuable paper."

II.—QUESTIONS ANSWERED BY EDITOR AND STAFF.

Parts of Lathe.—J. K. (*Richmond*) writes:—"I hardly know how to commence, but the fact is I have, or rather had, been, looking out for a practical paper for the amateur, but I had no idea of dropping across one which has already proved itself a great boon to me as an amateur carpenter, and I am sure it has to a great many others. Now what I want to get is a small rough lathe. I have a nice little workshop, I have made my own bench, and have got a good bench vice, iron vice, iron drill bits, etc., and, in fact, almost every sort of tool for ordinary carpentry or rough ironwork, and I have made some very good furniture, and I have some in progress from your designs. Now, what I want you to tell me, through WORK, is how I could make myself a small lathe for wood, to turn, say, uprights for whatnot, or such like. I have every opportunity for getting that done, I mean in the shape of ironwork, which I could not manage myself; the wood part I can easily get over. I have made the dog-chuck you gave in No. 2, so if you could kindly give me a few hints to help me, you make will greatly oblige me as well as help me, for I small things in my spare time, and sell them to add to my funds, and I find myself greatly in want of a little lathe. I don't want to buy any more of it than I can help, so if you can give me the hint you will greatly oblige me."—[I give your letter in full so that all readers may be aware of your inquiry, and what you are doing to help yourself. Supposing that you can make the wood frame of your lathe, the headstock, wheel, and crank could be obtained in Clerkenwell Road, late Wilderness Row, E.C., at any of the cheap tool shops that are to be found therein, and I would suggest a visit to Messrs. J. and S. Miller, 66 and 68, Clerkenwell Road. Anything less that a 5-inch centre lathe would be more of a boy's lathe, and not by any means a practical tool, especially to an amateur. A plain fly wheel and crank, headstock, mandrel pulley, and poppet head of a 5-inch centre lathe would cost you from 25s. to 30s.—G. E.]

Tobacco Pipes.—SMOKE.—The manufacture of clay tobacco pipes will not be treated in WORK. I am not acquainted with any book on the subject. The material used is a fine clay, well worked. They are made in moulds, and the perforation of the stem is effected by means of a wire.

Battery, Porous Bells, Accumulators, etc.—F. TUCKER (*Bristol*).—(1) I cannot find any reference to the battery named by you in Watt's book, latest edition. When copper forms the negative element in a solution of sulphuric acid it speedily becomes coated with a film of hydrogen, and the battery becomes polarised. This means a serious loss of power. In the Daniell cell this gas is absorbed whilst copper is being deposited. The cost of working a Daniell is less than that of the battery named by you, since the deposited copper is a valuable commodity. (2) In the earlier edition of Watt's book he may have given a recipe for making porous cells from plaster of Paris, but he does not repeat this in his last. The reason is obvious. That the game is not worth the candle you have now proved for yourself. It is one of the last things I should think of doing whilst porous cells of good quality can be obtained so cheaply. (3) Just think for a few minutes on the prime or first cost of accumulators (not less than £1 per cell), then the cost of acids for charging them, then the cost of the battery needed to form the plates, and then remember that you will only get about 80 per cent. of the power back again as electric current—that is to say, it will cost you 20 per cent. more to get the same current by the way you propose (leaving out cost of accumulators) than by using current direct from a primary battery. Where does the economy come in? Some day I may write on the subject, but it won't be just yet, for other more important subjects claim attention. (4) I do not clearly see what you mean by giving information in WORK in "a piecemeal fashion." The article on the Bunsen battery did not promise you a number of "glorious experiments" to follow, therefore I cannot see how you could expect them. The article was meant for *work*, not for play. You, and those who wish for it beside yourself, will have enough to occupy your hands, and minds too, shortly, in a series of articles dealing "exhaustively" with the way to make "electrical apparatus." I do not aim at pleasing my readers with a variety of subjects, but form a purpose and go ahead with it. I have not forgotten the fable of the "Old Man and his Ass," nor the lesson taught in it. This you will learn as you become better acquainted with WORK. Your complaint respecting "gigantic advertisements" is uncalled for. Neither the Editor nor any of his staff is in any way interested in a pecuniary manner with the things recommended in WORK, or in the firms whose names are mentioned as vendors of the goods named. *You* may not be interested in knowing where to get a good lathe or a good tool, but the information may be welcome to hundreds of other readers. In this we must study to please or serve the majority.—G. E. B.

Venetian Blinds.—J. A. H. (*Chepstow*).—A paper on this subject will appear shortly.

Repairing Chloride of Silver Battery.—CHLORIDE (*Plaistow*).—Your Gaiffe battery has failed because the chloride of silver has become exhausted. You must, therefore, coat the silver plates with fresh chloride of silver prepared as here directed. Place half a wineglassful of nitric acid mixed with a teaspoonful of rain water in a saucer or a cup, and put on a warm hob in the chimney corner. Add to this as much old silver as the acid will dissolve. This done, pour all into a basin two-thirds filled with rain water, and add common salt until all the silver has been thrown down as white chloride. Pour off the liquid, and wash the chloride with clean water, by pouring in the water and allowing the white powder to settle. Do this several times, then drain off all water, and dry gently in a saucer. When dry, spread a layer of it over each silver plate, and warm over a spirit lamp until it seems to melt and run over the plate, forming a dirty grey coat. This is horn silver, or fused silver chloride. Coat each plate in this way and then restore them to their places in the battery.—G. E. B.

Whitening Brass.—NIMROD (*Birmingham*).—Articles made of brass or copper may be whitened with a coating of tin or of silver as may be required, by boiling them in either one or other of the following solutions:—(1) Dissolve as much cream of tartar in boiling water as the water will take up, then add to it a little chloride of tin. Previously well clean the articles from all grease and corrosion; immerse them in the above solution together with a handful of grain tin, and stir all well together, whilst still boiling, until the articles are well coated with tin. Well wash in warm water, and rub in hot bran until bright. (2) Mix together 80 parts of cream of tartar, 80 parts of common salt, and 1 part of chloride of silver. Dissolve the whole in boiling water, and boil the articles in this solution, treating them as directed above. The deposits of tin or of silver from these solutions are very thin, and not so durable as coats of the same metals electro-deposited.—G. E. B.

Air-tight Joints in Wood.—H. W. (*Edinburgh*).—To make joints in wood air-tight, you can plough the meeting edges and tongue with hoop iron, or with wood secured with white lead.—J.

Clockwork Model.—SUBSCRIBER (*Sandbach*).—The only thing I can suggest is to make a fly

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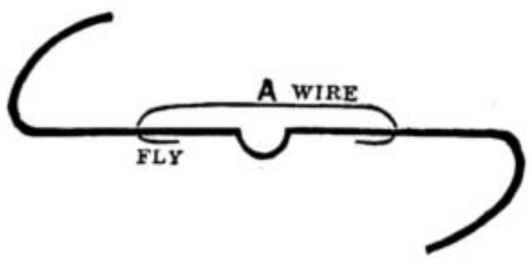
oblong in shape, as long as the rest of the works will allow, if working in the frame; if working outside the frame, of course, you may not be so restricted for room. Make it from very thin brass or tin, and then bend the shape of letter S, the bent part pointing the way the fly goes. See that it is nicely balanced, that is to say, that when perfectly at rest the arms are horizontal, not vertical. To fasten to the arbor of pulley, make across the centre, the short way, a hollow, so,



to fit the arbor; now, about half an inch each side of the hollow, and in the centre, make a small hole, and pass a piece of fine brass or iron wire, A (as sketch above), and in the arbor make a little groove to fit the wire; this will act as a spring, and keep fly tight to the arbor and in its place. The longer your fly the slower its action; the width does not matter so much. Try this; if no better, and you like to pack up and send to me, enclosing cost of return carriage, I will see what I can do, free of charge, unless very much is wanted. Perhaps your spring is unsuitable, that is to say, too strong when wound up, not properly or evenly tempered; try another, or fit stop-work to it, only using a few of the centre turns of it. In any case, let me know the result. You can find me through the Editor, if you want to send it to me.—A. B. C.

Cranked Hinges in Carriage Building.—YOUNG BODYMAKER.—I assume you mean not how to fix, but how to find the exact position in which the hinges (better known as outrigger hinges, in the coach trade) should be fixed, to ensure the proper and correct working of the outrigger, and also the concealed hinge above it, as if only slightly out of "true" with centre pin of the concealed hinge, the door, whether of a brougham, landau, or any other carriage upon which it may be fixed, could never be made to open or close properly, to the intense annoyance and disgust of all concerned, in that particular door. I will now try and explain the best method I know of, for the finding centre, and then briefly state one or two generally adopted methods of fixing the hinge to the door and body. As outrigger hinges are most generally used at the bottom of landaus and other carriages with equally short doors, with only one concealed hinge above, and that one fixed with the upper

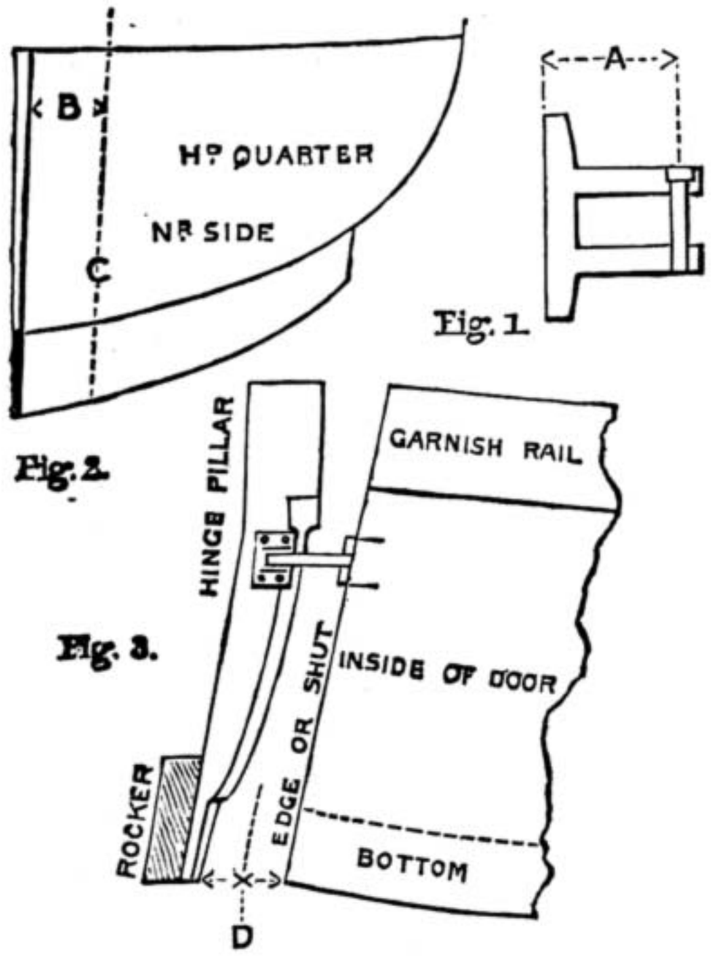


Fig. 1.

Fig. 2.

Fig. 3.

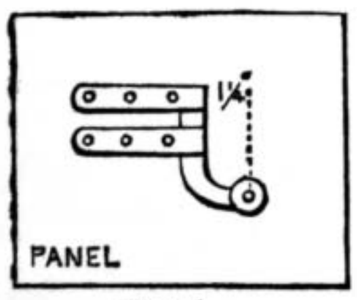


Fig. 4.

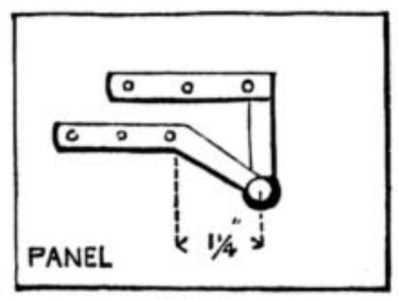


Fig. 5.

edge of its brass flap directly under the elbow line joint, we will take as our subject a canoe, or boat-shaped landau. Assuming you have already let in and properly fitted concealed hinge—we will suppose the size to be what is called 1¼ in.—take the exact distance from *shut*, that is, brass plate of concealed hinge, to the centre of pin on which hinge turns. Thus Fig. 1 A, with rule, or still better, a pair of dividers, place one leg of these exactly on edge of panel at the rabbet, and mark a point on the panel with the other leg, as at Fig. 2, B, from which point drop a perpendicular line, square down to the bottom of body, C, Fig. 2., that is, the centre of bottom hinge from door rabbet. Now fix hinge to door, and fix brass flap with door attached to hinge pillar; open the door as far as it will come out, square with body, support door so as to take the dead weight of the concealed hinge, and measure the exact centre of the open space, between outside of body where the outrigger is to be fixed, and the edge of door, as in Fig. 3 at D, that is, the centre of bottom hinge from outside of body. Now, if the bottom of body at that point is square across, it will be a good place to fix the hinge, so tack a piece of ¼-in. pine on bottom of rocker just under the centre just found, keeping it parallel with horizontal line of body. Mark the centre on the top side of this piece of board; also mark outside of rockers, and around bottom of hinge pillow, and outside of body to this centre; now shut the door, and mark along outside of door at bottom, also up to centre; take off the piece of board, and mark off outline of hinge enclosing the centre before mentioned, like Fig. 4 or, again, like Fig. 5. In either case, if the door bottom is level with bottom of rocker, you must have the bottom half of hinge cranked up, or the top half of hinge let into bottom of door, to allow flaps of hinge to bed on to their respective places, and close over each other; the spaces in between flaps of hinge on Figs. 4 and 5 is the clearance to allow door to close without touching at those points—*i.e.*, edges of flaps. Fig. 4 shows the hinge with back edge of flaps level with door rabbet, Fig. 5, with bottom or body flap coming square out from centre line, and the top or door flap level with door at rabbet, but outer or neck piece cranked or curved to meet that centre. Care must be taken that the centres of both hinges exactly correspond, both perpendicularly and at right angles, and as the bottom of door and body are curved, the smith, when setting the hinge, will arrange to have the knuckle arranged as described. Now, as to the best place to fix: some coach builders place this hinge immediately under the bottom side, when it projects far enough out from the rocker piece below it; personally I consider this a wrong position. Firstly, being too high up, too near top hinge, and consequently causing a loss of steadiness; and secondly, as being rather unsightly, and breaking somewhat the easy and graceful flow of the bottom line of moulding; it has, however, two advantages, a much shorter hinge is necessary, and is not so liable to vibration; but, again, is likely to wear out the bolt and holes in the knuckle quicker; this is a decided drawback. Now, if the extreme bottom of body is made level across, and not bevelled on outer edge of rocker and door bottom, I consider that the best place for fixing the hinge, the only drawback being that a longer and stronger hinge is required, to come out far enough to reach the centre. At that point, the upper and lower hinges being much farther apart, they are a much steadier support to the door, do not wear out so quickly, and what is of great importance, are vastly easier to fix or to repair when disarranged by use or accident. I fear this will appear rather a long instruction to Y. B., but he will know that almost any part of coach-making requires minuteness of detail, if it is to be properly understood; and if I have not made this sufficiently clear to him, I will endeavour to do so in reply to his queries in "Shop." The question, as he gives it, certainly does him credit, being somewhat difficult to impart so as to be thoroughly understood, except by personal supervision, and yet very easy of accomplishment when required by actual practice, at least it has been found so for years past by PHAETON.

Curling Iron Stand.—M. K.—The cost of the provisional patent for nine months is £1, and by deducting this from the amount asked by the patent agent, you can see how much would go to him as his remuneration for work done. I am afraid there is not much to patent in the invention. It is only an old article put to a new use. The idea is certainly good, but I scarcely dare venture to tell you to go on with it, because you have no means of pushing a sale when you have had them made. It will cost you £1 to get provisional patent for nine months, and at the expiration of that time you will have to pay £3 more for complete patent. It will not be difficult to find a man to make the articles, but you will find it difficult, and perhaps expensive, to promote the sale of them. If you accept the offer made by the patent agents, it may be that they will sell it for you, that is to say, sell the right to someone to manufacture the article. I cannot say anything with regard to the probability of your making money by it. Ask the patent agents plainly if they can manage to sell the invention for you, and at what price. If they can, so much the better for you, on the bird-in-the-hand-worth-two-in-the-bush principle. Failing this, write to the Editor of the "Girls' Own Paper," and see if he will accept a description of the thing itself, with illustrations, and pay you first. This is all I can suggest, but if you prefer to obtain protection, and want to know a person capable of making it, I can, and will, give you the name of a trustworthy person who could make the stands: but whether he will or will not do so is more than I can say.

Designs for Fretwork.—J. A. J. (*Stratford*).—I am sorry to learn from you that an accident which has caused injury to your spine prevents you from ever working at your trade as a carriage maker again. I know it must give you the heartache to be compelled to drop out of the ranks, and do but little when you would fain be doing much, and you have my sympathy to the utmost. You say you have taken to fretwork to earn a little, but cannot get good patterns, having tried many who advertise designs, only to meet with disappointment. Have you tried Mr. Henry Zilles, 24 and 26, Wilson Street, Finsbury; and Mr. G. Busschotts, Park Lane, Liverpool? These dealers supply continental designs, and some are extremely good. Indeed, I do not know any dealer that has not good things amongst his designs; and, I think, if you procure the miniature sketches that most dealers send out, you will find among them something to your mind. With fret cutting, I should also try wood carving. Again, if you are fortunate enough to be able to expose articles for sale, either at your own residence, or in any shop kept by a friend, you might find it of advantage to make models, games, doll's furniture, etc., all of which would be light work that you could manage without much fatigue. There will be some pretty designs for fretwork from the pencil of Mr. J. W. Gleeson-White in forthcoming numbers of WORK, but it is difficult to give full size patterns without large sheets, which are very costly. Among other things, if you cannot draw with ease by all means study drawing, and see what you can do in the way of ticket writing, for which you will derive assistance from Mr. Benwell's paper on "Sign Writing and Lettering." You ask me to help you, and it seems to me that I can best do this by the hints and suggestions that I have endeavoured to place at your disposal.

Building Construction.—PIXIE (*Granite City*).—It takes some time to get on to such a subject as building construction, and possibly it may be found needful to hold it over for another volume. "Monumental and Stone Carving" is a subject on which it is very difficult to find a writer. I was speaking the other day to a man who was accustomed to cut letters on granite, and apparently a first-class hand at the work, but he could not write himself, nor could he tell me of any one who could.

Fret Sawing Machine.—J. F. W. C. (*Hull*).—The best fret sawing machine at present in the market is the Britannia Company's No. 8 machine. If you will write to the Company, Colchester, you will be supplied with all particulars. It is intended to construct a small lathe to be used in combination with this machine, and any requirements on your part with regard to fittings could be easily satisfied.

Wood Screw Cutters.—J. H. E. (*Shepherd's Bush*).—The screw boxes and taps for cutting screws in wood are illustrated in page 64 of Messrs. Peygeot Frères' catalogue, or, rather, price list, and prices are given according to the index in page 50. On turning to this to give you the information you require, I find that my price list is imperfect, pages 47 to 50 being missing. If you write to Messrs. Alex. Von Glehn & Co., 7, Idol Lane, London, E.C., the prices, I am sure, and the sizes in which the screw boxes are made, will be at once supplied.

American Saddlers' Tools.—W. O. (*Rochdale*).—I am not aware that there is any difference between the tools used by American saddlers and those in use among English saddlers. The tools comprise punches of different sizes, creases of various kinds, cutting gauges, head knives, round knives, bridle cutter's knife, edging irons, pliers, pincers, saddler's palm, punch pliers, screw punches, etc., stuffing rods for making collars, awls, and other articles, all of which can be procured through any ironmonger or hardware merchant. If you cannot get them at Rochdale, write again, and I will give you the address of a London dealer who can supply them.

Violin Tools.—J. W. (*Battersea*).—The fine-toothed veneer plane, which, like the tool you describe, bears an upright blade, will do all you require for reducing veneers to the proper thickness. As you say, some of the trade purfling is certainly "rubbish." I do not know any one except myself who has the black veneers. To make good mitres it is not necessary to use three separate strips. First cut your mitre to fit, and then bend the purfling over a warm iron. It is rather awkward to give instruction as to colouring a varnish to match without seeing the original, but I have an impression that the varnish you mention is not a *coloured varnish*, but a spirit varnish over a wood stain. The violoncello sound-hole punches you can buy at Lafleur's, Green Street, Leicester Square; all the others you can get from Withers & Co., 51, St. Martin's Lane.

Japanese Patterns.—MINER.—Books of Japanese Pattern are not easy to obtain. Mr. B. T. Batsford, 52, High Holborn, W.C., has them now and again, and Messrs. Liberty, Regent Street, W. They range from 9d. to 5s. or 10s., but the cheap ones are more useful for ordinary purposes.—G. W.

French Polishing and Veneering.—T. A. (*Glasgow*).—Articles on these subjects are in preparation, when all that relates thereto will be fully dealt with.

Amateurs and Wood-buying.—F. W. H. (*Upper Tooting*).—A paper on this important matter is being prepared for the advantage of all readers.

Papier-mâché Panel.—A. L. W. (*Aberystwyth*).—Messrs. McCullum and Hodson, Summer Row, Birmingham, will, doubtless, supply the article required.—S. W.

House Painting and Graining.—W. H. F.).—Our correspondent asks us to give "the certain proportions for mixing oil colours" for the above purposes. This is a question which would involve more than the entire weekly space devoted to "Shop" to answer fully. In the first place, in

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mixing ordinary white lead and oil paint, there are no certain proportions. The amount of each article used in its mixing does, or certainly ought to, very materially depend upon the work undertaken. Independent of preparation—which is a very important item in good house-painting—the nature of the paint should be very different when painting, on the one hand, new woodwork, and on the other new parian, or plaster walls. Of the four coats each should have, the proportions of lead, oil, etc., would be different each time in both cases—that is, if painted by a tradesman who knew his craft. To speak of colours and graining in this answer is quite out of the question, as our correspondent makes only a general, unlimited inquiry. If W. H. F. has any pressing and particular object in view in making this inquiry, we would endeavour to aid him if he writes and states particulars. Beyond this we must advise him to carefully peruse the pages of WORK, when he will be rewarded by finding a complete and exhaustive treatise of the subject of our head line, which is now being specially written by an experienced London decorator.—F. P.

Imitation Lead Lights.—H. W. H.—These are generally known as "window transparencies," being a class of transparent, oiled papers, and which, when properly affixed to the glass of windows and door panels, form a very durable and decorative substitute for painted and coloured lead light glazing. There are several makes, I append two—W. E. Tuker & Co.'s, "Die ac Note," and M'Caw, Stevenson & Orr's patent "Glacier" decoration. Hinde Bros. (London and Birmingham) are, I believe, the wholesale vendors of the first named; M'Caw & Co. are the patentees and manufacturers of the "Glacier." The latter is, I think, that most used, and an article which I can personally recommend, and can be obtained direct from the makers, Linenhall Works, Belfast, Ireland. Perry & Co., the pen makers, Holborn Viaduct, are still, I believe, the wholesale London agents for "Glacier." Most established stationers are also agents for one or another maker of transparencies, where drawings and designs can usually be seen, and through whom our correspondent could doubtless get all he requires. Directions for use usually accompany the article, but I would advise that the glass should be very carefully cleaned, and the design then arranged so that it can be readily fixed. The glazed or bright side of the transparency is then wetted with water, or the glass can be wetted, placed in position, then all bubbles smoothed out with soft cloth or sponge, working from the centre to the outsides. It must then be left for not less than twelve hours, to allow the water to evaporate and the article to get firmly fixed and hard. Although the process appears very simple, care and patience are necessary to make a good job, and it is advisable to watch that, whilst drying, the transparency does not blister up from the glass. When properly fixed and hard, coat the transparency with best light copal varnish; it will then be thoroughly protected both sides.—F. P.

Covering Plush Frames for Terra-Cotta Plaques, etc.—J. C. (*Aberdeen*).—No preparation of the wooden frame is necessary; all that is wanted is some good strong glue for sticking down the plush. Supposing the frame to be circular or oval, the plush is best cut in a single piece large enough to overlap the wood every way, and it must be nicked or snipped on the inner edges that it may wrap over without creasing. The wood has then to be glued, the plush stretched carefully over it, and well pressed down with a clean cloth or duster. Small square frames are covered in the same way. In covering large square frames it is usual to economise plush by cutting a separate piece for each side, and mitring them at the corners. The joining has to be hidden by a piece of silk cord glued over it. Round and oval frames are sometimes covered in this latter manner with small pieces of plush, the joints being corded; but the best and safest work is made with the single piece. For an answer to his other query (preparing canvas) J. C. is referred to our reply to WAITING (see page 285).—M. M.

Photographic Camera.—T. R. C. (*Ashton-under-Lyne*).—The manufacture of appliances for photography will not be neglected, but their making will be work for the winter rather than for the present summer.

III.—QUESTIONS SUBMITTED TO CORRESPONDENTS.

Solidifying Petroleum Oil.—OX GALL (*Manchester*) writes:—"If your correspondent, P. W. S. (*Poplar*), or any other correspondent, will kindly tell me how to solidify petroleum oil, I shall deem it a great favour. I have no objection to stating for what purpose I require the oil solidified.

Water Floats.—REYNARD (*Leeds*) writes:—"Will some of your scientific readers kindly inform me what size piece of circular cork will sustain a man of 12 stone above water? Also what size tin cylinder will do the same?"

Carpet Fitting.—M. G. (*Belfast*) writes:—"If any readers know of a book which would assist in measuring and fitting carpets, etc., would he be good enough to let me know?"

Photo Camera Lens in Magic Lantern.—PALETTE writes:—"I have read that a photo-camera lens can be very successfully used ina magic lantern. I should like a verification (or otherwise) of this statement, with instructions."

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

French Polishing.—JACK H. sends the following in reply to T. A. (*Belfast*) (see page 174):—"Denham Bros.' patent 'filler' is said to be a guaranteed cure for the 'sweating' of French polish. It is now in daily use all over the United Kingdom, and is acknowledged to be one of the best inventions ever introduced to the trade. It has long been admitted by all practical men that there is a great necessity of improvement in the old system of polishing, and a demand for a substitute for raw linseed oil, but yet a substitute which will answer the same purpose in bringing up the figure or grain of the wood, without any of the after-injurious effects of oil which, as is well known, is one of the greatest difficulties the trade has to contend with. This difficulty has been entirely and most successfully overcome by the invention under description, the claims of which no person in the trade—in these times when there is a great demand for good work—can afford to disregard or overlook. Firstly, it does away with oiling or 'fatting' over the work previous to polishing, and answers as a 'filler' at the same time, without any extra labour. It is a certain preventive for what is commonly known as 'sweating out of the oil' after an article has been finished two or three months. It is easily worked, and keeps down the grain as no other 'filler' does; saving both labour and material. It is transparent, and does not show white in the grain. It is made in seven different colours, to suit all kinds of wood—namely, white for ash, pitch pine, light oak, satin wood, maple, and all light woods; black for ebonised woods; dark oak for brown or pollard oak; walnut, mahogany, dark mahogany, and rosewood; also birch mahogany, specially prepared, stained ready for all hard woods, such as birch, beech, elm, etc., which are usually stained to imitate mahogany. There is nothing in its composition which will eat or burn away the polish; or which is in any way injurious to health when working it. The 'filler' is specially suitable for bobbin manufacturers, in place of sizing, thus preventing cracking of the varnish, and also keeping down the grain, without any extra labour. It may be had from all wholesale chemists and druggists, oil merchants, French polish and varnish makers, or from the sole patentees and makers, Denham Brothers, Hall Street, Halifax, Yorks.

Joints in Indiarubber.—P. P. (*Withington*) writes in reply to W. P. (*Grangetown*), (see page 190):—"Bicycle tires are made in a mould complete, and are not jointed, as W. P. imagines. They can be mended when broken by putting a piece of hot wire covered with cement into a hole made in both ends, and bringing the rubber together, the joint forming a kind of dowel. Indiarubber is vulcanised with powerful machinery and steam."

Facsimile by Electro Process.—E. L. writes in reply to ELECTROTYPE (see page 190):—"Get some good beeswax, and melt it, then pour it into a shallow metallic dish. When sufficiently hard to prevent the wax sticking to anything brush it over lightly with plumbago, also the article to be reproduced; then press the letter or block into the wax, being sure that it is pressed level all over, then take away the block, and you have the mould. If the mould is satisfactory, put a bright polish on it by using black lead and a very soft brush, and it is then ready for the battery. The battery itself is made with about 4 parts acid to 1 of water, with a silver plate and zinc one facing each other. The tank in which the mould is suspended by a metallic connection is made up of 3 parts water to 1 of sulphuric acid, and a small proportion of sulph. copper. The mould should face a sheet of copper; and, if properly connected, in about twelve hours there will be a copper shell on the mould. To get the shell off, the best way is to pour boiling water on the mould, and the shell will come off by a little gentle easing. After the shell is off it should be tinned with solder by placing it on a hot plate, previously putting some spirits of salts on to make it run, allowing the solder to melt, and when it is melted it should be backed up with metal. Of course, if ELECTROTYPE wishes to do electrotyping for amusement and experiment, the above directions will do very well; but if, on the other hand, he wants it for business purposes, I should strongly advise him to take it to an electrotyper's, and have it done. The cost would be less than 1½d. an inch."

Glaze for Finishing French Polishing.—W. H. B. (*Peterborough*) writes in reply to W. H. B. (*Redditch*) (see page 174):—"I beg to forward receipt for glaze as asked for: Take 1 oz. of gum benzine, ½ gill methylated spirits, thoroughly bruise the gum, mix, and shake the bottle occasionally for three days; strain through fine calico. Also ox gall for brown oak, ¼ oz. vandyke brown, 1 pint spirits of ammonia, 1 oz. bichromate potash. By experimenting on a plain piece of wood you will get what shade you require by one or more coats, then brush over with French polish (not varnish) thinly."

Cleaning Oil Paintings.—A. F. (*Falmouth*) writes in reply to L. S. (see page 190):—"Seeing that L. S. wishes to know how to clean an oil painting, I may say that I have done them very satisfactorily in the following way:—Take a raw potato, peel it, and cut it in two, then dip the end in water, and rub it well over the painting; afterwards sponge it with clean water, and then dry it with a cloth. If A. F. tries this method, the end he has in view will be secured.

Trade Notes and Memoranda.

IN a paper on the traffic in London, recently read by Mr. J. S. Jeans, before the Society of Arts, he says that the number of passengers annually carried by railway, omnibus, tramcar, and river steamers, was some 470,000,000, being nearly twelve times the present population of the United Kingdom. Another fact which he mentioned was that, within twelve years, the increase in the number of passengers carried on the six metropolitan railways that deal chiefly with local traffic has been about 72,000,000, or, including season ticket holders, probably about 100,000,000.

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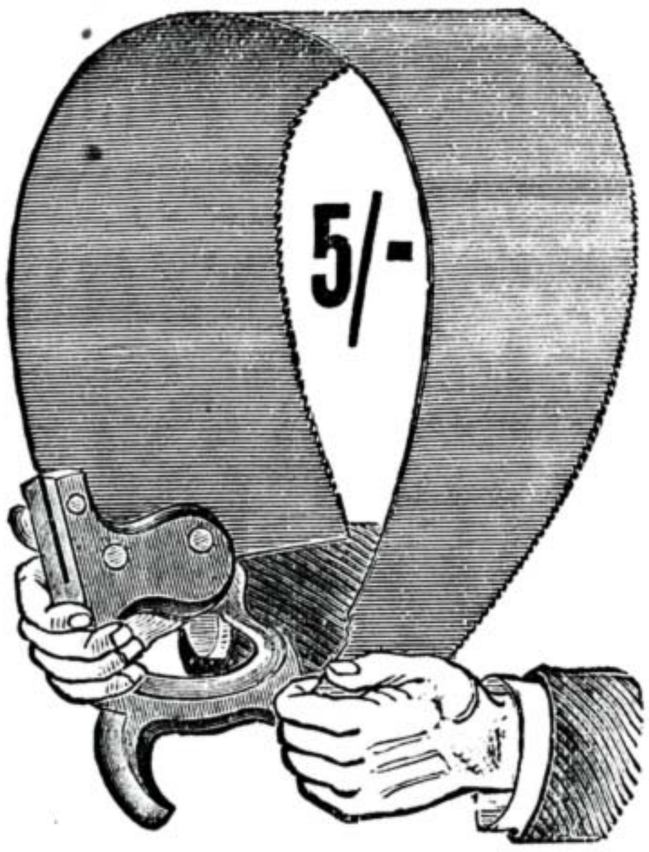

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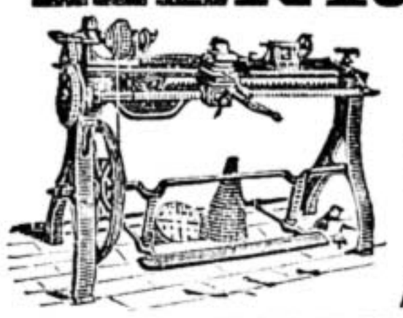

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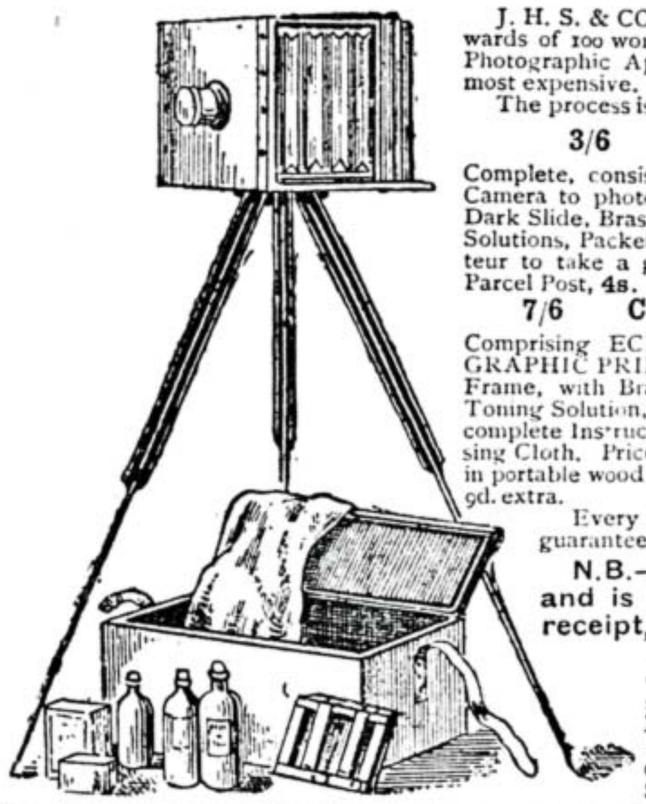

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